Motivational Model of Problem Drinking for Men and Women

by

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Abstract

This thesis tested a path model of the relationships of reasons for drinking and reasons for limiting drinking with consumption of alcohol and drinking problems. It was hypothesized that reasons for drinking would be composed of positively and negatively reinforcing reasons, and that reasons for limiting drinking would be composed of personal and social reasons. Problem drinking was operationalized as consisting of two factors, consumption and drinking problems, with a positive relationship between the two. It was predicted that positively and negatively reinforcing reasons for drinking would be associated with heavier consumption and, in turn, more drinking problems, through level of consumption. Negatively reinforcing reasons were also predicted to be associated with drinking problems directly, independent of level of consumption. It was hypothesized that reasons for limiting drinking would be associated with lower levels of consumption and would be related to fewer drinking problems, through level of consumption. Finally, among women, reasons for limiting drinking were expected to be associated with drinking problems directly, independent of level of consumption. The sample, was taken from the second phase of the Niagara Young Adult Health Study, a community sample of young adult men and women. Measurement models of reasons for drinking, reasons for limiting drinking, and problem drinking were tested using Confirmatory Factor Analysis. After adequate fit of each measurement model was obtained, the complete structural model, with all hypothesized paths, was tested for goodness of fit. Cross-group equality constraints were imposed on all models to test for gender differences. The results provided evidence supporting the hypothesized structure of reasons for drinking and problem drinking. A single factor model of reasons for

limiting drinking was used in the analyses because a two-factor model was inadequate. Support was obtained for the structural model. For example, the results revealed independent influences of Positively Reinforcing Reasons for Drinking, Negatively Reinforcing Reasons for Drinking, and Reasons for Limiting Drinking on consumption. In addition, Negatively Reinforcing Reasons helped to account for Drinking Problems independent of the amount of alcohol consumed. Although an additional path from Reasons for Limiting Drinking to Drinking Problems was hypothesized for women, it was of marginal significance and did not improve the model's fit. As a result, no sex differences in the model were found. This may be a result of the convergence of drinking patterns for men and women. Furthermore, it is suggested that gender differences may only be found in clinical samples of problem drinkers, where the relative level of consumption for women and men is similar.

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Introduction

In general, moderate consumption of alcohol has been considered a pleasurable and acceptable social activity. For example, drinking alcohol is associated with relaxation and such celebratory events as weddings and holidays. However, drinking has also been associated with drunkenness, acting out, depression, alcoholism, and social stigma (McKay, Murphy, Maisto, & Rivinus, 1992; Sadava, 1985; West, Drummond, & Eames, 1990; Weinberger & Bartholomew, 1996; Lo, 1996). Given that consumption of alcohol is associated with both pleasant and unpleasant experiences, it follows that most people will possess both reasons for drinking and reasons for limiting drinking. For example, 'Bob' may have a couple of drinks at a local bar, as a way of socializing with friends, but may choose to limit the amount consumed, to avoid drunkenness and loss of control.

Problem drinking is the consumption of alcohol, in conjunction with one or more symptoms of alcohol abuse (Doweiko, 1999). The American Psychiatric Association (1994) estimated that 60% of male drinkers and 30% of female drinkers experience at least one transient alcohol-related problem (Doweiko, 1999). Furthermore, others have reported that 30 to 40% of drinkers experience at least one symptom of alcohol abuse (Kaplan, Sedock & Grebb, 1994; as cited in Doweiko, 1999). Problem drinkers differ from alcoholics in that they are not necessarily physically addicted to alcohol (Doweiko, 1999). This thesis addresses antecedents of drinking problems, among drinkers with varied levels of consumption.

This study developed and tested separate motivational models of problem drinking for men and women. The models predicted that reasons for drinking and reasons for limiting drinking would influence level of consumption and its subsequent consequences. The validity of the model was tested through the analysis of cross-sectional data using structural equation modeling. A brief description of the structural elements making up the proposed models follows.

In previous research, problem drinking has been conceptualized as consisting of a single factor, including both consumption and drinking problems (Sadava, 1985). Although consumption is related to drinking problems, such that the more alcohol consumed, the higher the incidence of drinking problems (Carey & Correia, 1997; Sadava, 1985), there is evidence of drinking problems that are independent of level of consumption (Hughes, Power & Francis, 1992; Weinberger & Bartholomew, 1996). As a result, this study operationalized problem drinking as being composed of two constructs, consumption and drinking problems, with a positive path from consumption to drinking problems. This allows for two possible paths to drinking problems: a direct path to problems, independent of level of consumption, and a path to problems through level of consumption (Cooper, Frone, Russell & Mudar, 1995; McCreary & Sadava, manuscript in preparation; McCreary & Sadava, 1998; Sadava & DeCourville, 1997). In this study, reasons were hypothesized to be associated with drinking problems through these direct and indirect paths.

The hypothesized structure of reasons for drinking consisted of two related factors: positively reinforcing reasons for drinking and negatively reinforcing reasons for drinking. Positively reinforcing reasons were associated with the enhancement of already

positive moods and/or situations, whereas negatively reinforcing reasons were associated with the relief of aversive moods and/or situations (e.g., Carey & Correia, 1997; Carrigan, Samoluk & Stewart, 1998; Cox & Klinger, 1988). Some examples of positively reinforcing reasons for drinking included: to celebrate, to socialize, and enjoy the taste. Examples of negatively reinforcing reasons for drinking were: to cope, to forget about stresses, and to enhance social confidence.

In the motivational models of problem drinking, reasons for limiting drinking consisted of two related factors: personal reasons for limiting drinking and social reasons for limiting drinking. Personal reasons for limiting drinking were based on internal factors, such as one's mood and/or beliefs, and included the following reasons for limiting drinking: to avoid a hangover, financial concerns, and to avoid loss of control over one's behaviour (e.g., Cooper et al., 1995; Hermos, Locastro, Glynn, Bouchard & DeLabry, 1988; Jung, 1977). Social reasons for limiting drinking were based on external factors such as social situations and/or sanctions (e.g., Cooper et al., 1995; Hermos et al., 1988; Jung, 1977). Examples of social reasons for limiting drinking were: religious beliefs, fear of breaking the law, and parental disapproval.

In the proposed model, it was hypothesized that higher levels of consumption would be associated with an increase in drinking problems. In addition, it was predicted that both positively and negatively reinforcing reasons for drinking would be associated with higher levels of consumption and, in turn, more drinking problems. Negatively reinforcing reasons for drinking were also predicted to be associated with more drinking problems directly, independent of level of consumption. The model predicted that all reasons for limiting drinking would be associated with lower levels of consumption and,

in turn, fewer drinking problems. For women, the model predicted a direct and positive relationship between reasons for limiting drinking and drinking problems. Diagrams of the hypothesized paths for the motivational models of problem drinking for men and women are depicted in Figures 1 and 2.

Figure 1. Motivational model of problem drinking – men.

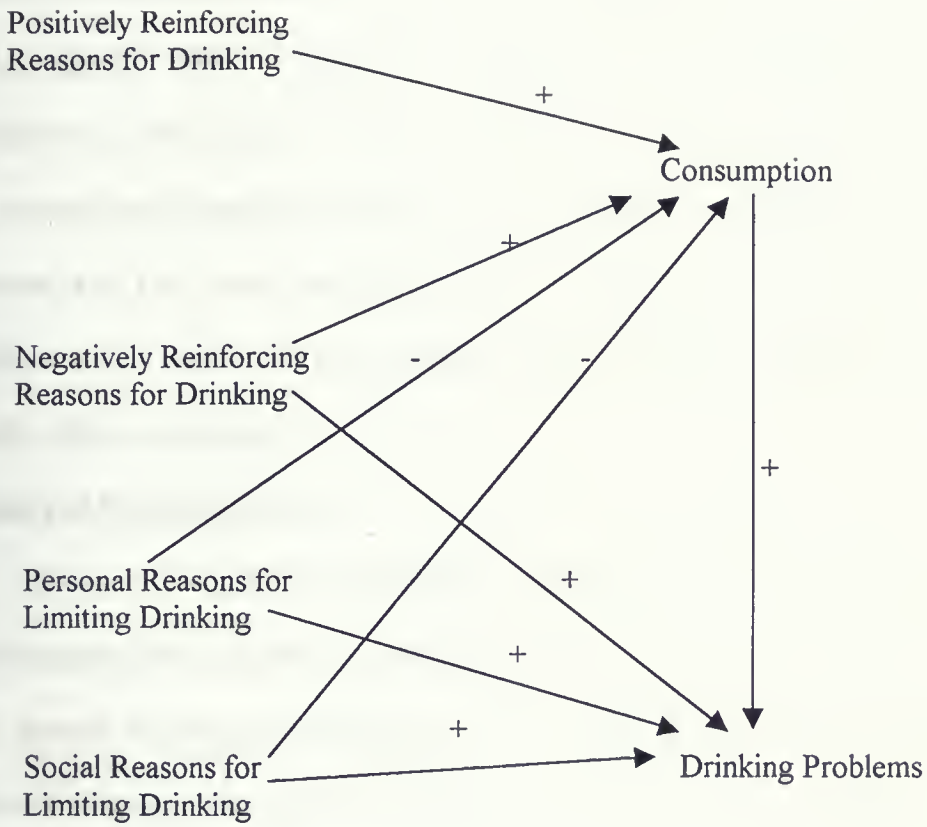

Figure 2. Motivational model of problem drinking – women.

The hypothesized direction of causal effects was from reasons to consumption and drinking problems. However, reasons were reported subsequent to drinking, and therefore, the causality involved may be reversed, with level of consumption and drinking consequences influencing reported reasons for drinking. That is, reasons for drinking may actually indicate post-hoc explanations of drinking behaviours. Furthermore, the causality involved may even be bidirectional, with drinking behaviours and reasons having reciprocal effects on one another. However, given that I hypothesized a motivational model of problem drinking, in which reasons drive consumption, and since the literature implies unidirectional causality from reasons to consumption and drinking problems (e.g., Lex, Mello, Mendelson, & Babor, 1989; Pang, Wells-Parker, & McMillen, 1989; West et al., 1990; Windle & Barnes, 1988), it is this direction of causality that was analyzed.

Structure of Problem Drinking

Research conducted on the structure of problem drinking contains a multitude of operational definitions, many of which are incomparable in nature (Berkowitz & Perkins, 1986; as cited in DeCourville & Sadava, 1997; Schlegel, DeCourville, D'Avernas, Manske & Ebbeson, 1991; as cited in DeCourville & Sadava, 1997). This inconsistency is, in part, due to the fact that the majority of these studies operationalize problem drinking as a unitary construct, using measures of consumption and adverse consequences of drinking as equivalent or interchangeable (Sadava, 1985). Of course, level of consumption has always been a strong predictor of alcohol-related problems (West et al., 1990). That is, the more alcohol consumed, the greater the likelihood of adverse consequences from drinking (e.g., Carey & Correia, 1997; Lex et al., 1989;

McKay et al., 1992; West et al., 1990). However, although consumption and drinking problems are positively correlated, the overall average correlation is modest (.368) (Sadava, 1985). In fact, they typically share only about 13.5% of their variance in the general population (DeCourville & Sadava, 1997). Indeed, some researchers have found that groups classified as high and low in drinking problem severity do not differ in their alcohol consumption (McKay et al., 1992; Sadava 1985). As a result, consumption of alcohol alone is an inadequate predictor of problems resulting from drinking (Sadava, 1985; Weinberger & Bartholomew, 1996). A multidimensional conception of problem drinking is therefore necessary (White, 1987; as cited in DeCourville & Sadava, 1997; Sadava, 1985).

There is a substantial increase in the variance accounted for in problem drinking, when it is conceptualized as composed of two factors: a general factor including consumption and problems derived from level of consumption, and a problem factor that is independent of level of consumption (e.g., Cooper et al., 1995; DeCourville & Sadava, 1997; Sadava, 1985;). Furthermore, there is evidence that these constructs represent two paths through which predictor variables can relate to drinking problems: a direct path to problems, and an indirect path to problems, through alcohol consumption (Cooper et al., 1995; McCreary & Sadava, 1999; McCreary & Sadava, 1998; Sadava & DeCourville, 1997).

Given the evidence for two factors and two paths to drinking problems, problem drinking was operationalized as composed of two related factors, consumption and drinking problems, with a positive path from consumption to problems. Consequently, it

was possible for reasons to influence drinking problems directly, or indirectly through consumption.

Importance of Cognitive Factors in Drinking

During the last 25 to 30 years, the literature on alcohol use and abuse has broadened its focus from the study of the physical effects of alcohol and purported psychopathology, to include the study of the cognitive factors involved in initiating, maintaining, and accelerating drinking behavior (Goldman, Brown, & Christiansen, 1987). Cognitive factors are no longer considered variables to be controlled for, but as important determinants of consumption and consequences arising from drinking (Goldman et al., 1987).

This increased attention to cognitive factors arose out of placebo studies conducted on the pharmacological effects of alcohol (Goldman et al., 1987). Because a placebo design includes a condition in which participants are falsely led to believe that they have consumed alcohol, it gives insight into cognitions regarding the outcomes of drinking, often referred to as alcohol-related expectancies (Sher, Wood, Wood & Raskin, 1996). In fact, the use of placebo designs resulted in much evidence supporting the importance of expectancy effects on alcohol consumption and related behaviour (Marlatt & Rohsenow, 1980; as cited in Cronin, 1997; Goldman et al., 1987). Studies conducted using self-report measures of expectancies, further validated the importance of alcohol-related expectancies on drinking (Cooper et al., 1995; George, Frone, Cooper, Russell, Skinner, & Windle, 1995; Hesselbrock, O'Brien, Weinstein & Carter-Menedez, 1987; Sher et al., 1996). These results indicate that cognitions regarding alcohol consumption are important determinants of drinking behaviour and its consequences.

In addition to alcohol-related expectancies, the literature has established reported reasons for drinking alcohol as important cognitive predictors of alcohol consumption and drinking problems (e.g., Cooper et al., 1995; McCarty & Kaye, 1984; O'Callaghan & Callan, 1992; Sadava, 1986; Smith, Abbey & Scott, 1993). In fact, reasons for drinking and alcohol-related expectancies are positively correlated (Cooper et al., 1995; Wood, Nagoshi, & Dennis, 1992;). However, there is evidence that reasons for drinking alcohol are stronger predictors of drinking behavior than are alcohol-related expectancies. Indeed, reasons for drinking alcohol have been found to predict alcohol consumption and drinking problems, after controlling for expectancies (Wood et al., 1992; Cronin, 1997). On the other hand, alcohol-related expectancies do not predict drinking behaviours, after taking into account reasons for drinking (Cronin, 1997). It has been suggested that reasons for drinking alcohol are stronger predictors of drinking behavior, because of their more proximal relationship to the decision to drink (Cronin, 1997). For example, expecting a particular alcohol-related outcome, does not indicate motivation to drink alcohol to obtain this outcome. Conversely, reasons for drinking are more informative, as they indicate both alcohol-related expectancies and motivation to obtain these outcomes. As a result, reasons for drinking are conceptualized as a subset of alcohol-related expectancies, in that they include only the alcohol-related expectancies that one is motivated to obtain. Due to their stronger predictive abilities, reasons for drinking alcohol and their relationship with the consequences of drinking were examined in this study.

Reasons for Drinking

In the social psychological literature, the study of 'reasons' generally involves the investigation of the cognitions motivating certain behaviours such as drinking, smoking, suicide attempts, and eating (Hirsch & Ellis, 1996; Sussman, Dent, Nezami, Stacy, Burton, & Flay, 1998; Tuomisto, Tuomisto, Hetherington & Lappalainen, 1998). Indeed, reasons for drinking have been established as significant and meaningful predictors of alcohol use and alcohol-related problems (e.g., Lex et al., 1989; Pang et al., 1989; West et al., 1990; Windle & Barnes, 1988).

Four basic reasons for alcohol consumption have been derived from the literature on reasons for drinking (e.g., Carey & Correia, 1997; Cox & Klinger, 1988; Cronin, 1997; McKay et al., 1992; Plant, Bagnall, & Foster, 1990; Stewart, Zeitlin, & Samoluk, 1996): personal/positive, personal/negative, social/positive, and social/negative. Personal/positive reasons involve drinking to enhance mood or for enjoyment. They include such reasons for drinking as: like the taste, quenches thirst, and improves appetite (Cooper et al., 1995; Smith et al., 1993). Personal/negative reasons indicate drinking to relieve or dampen negative feelings, and thus involve such reasons for drinking as: to escape problems, to forget, and to reduce tension (Cooper et al., 1995; Smith et al., 1993). People who drink for social/positive reasons are motivated to drink alcohol to heighten positive social experiences. They include such reasons for drinking as: to celebrate, for ritualistic reasons, and to be sociable with friends (Dunne, Galatopoulos, & Schipperheijn, 1993; Smith et al., 1993). Finally, social/negative reasons involve drinking to decrease negative experiences associated with socializing; for example,

drinking to feel more comfortable, more confident, less nervous, or as a result of peer pressure (Pang et al., 1989; Smith et al., 1993).

This taxonomy is related to two dimensions in which reasons for drinking are typically classified: positively reinforcing reasons versus negatively reinforcing reasons, and social reasons versus personal reasons. Positively reinforcing reasons are associated with the enhancement of already positive moods and/or situations, whereas negatively reinforcing reasons are associated with the relief of aversive moods and/or situations (e.g., Carey & Correia, 1997; Carrigan et al., 1998; Cox & Klinger, 1988). Additionally, personal reasons are those pertaining to the mood or state of the self, whereas social reasons concern the social situation or circumstance (e.g., Cooper et al., 1995; Hermos et al., 1988; Jung, 1977). Separating these dimensions yields the four categories of reasons for drinking previously listed: personal/positive, personal/negative, social/positive, and social/negative. Evidence for the validity of this taxonomy is found in the literature. For example, a similar set of categories of reasons for drinking was derived from Cox and Klinger's (1988) theory on motives for drinking (Cooper 1994; as cited in Bradizza, Reifman, & Barnes, 1999). In addition, these four sets of reasons have been predicted by different sets of demographic and psychosocial variables, and have shown different predictive abilities for the quantity and frequency of alcohol consumption (Smith et al., 1993).

For purposes of this study, only the dimension of positively versus negatively reinforcing reasons was used to categorize reasons for drinking. Since this study used archival data, the list of reasons for drinking, from which these categories were sought, was predetermined and did not have the items necessary to reveal the four hypothesized

categories. Furthermore, the hypothesized models did not address the social/personal dimension, so including this dimension was unnecessary.

Alcohol consumption and reasons for drinking. The literature reveals a significant and positive relationship between the number of reasons for drinking endorsed and the amount of alcohol typically consumed (e.g., Graham, Clarke, Bois, Carver, Dolinki, Smythe, Harrison, Marshman & Brett, 1996; Hesselbrock et al., 1987; Lex et al., 1989; Plant et al., 1990; O'Callaghan & Callan, 1992; Weinberger & Bartholomew, 1996). It follows then that both positively and negatively reinforcing reasons would be associated with heavier consumption. However, it has been found that a high endorsement of negatively reinforcing reasons for drinking is more strongly associated with increased consumption (e.g., Abbey et al., 1993; Graham et al., 1996; McCarty & Kaye, 1984; Smith et al., 1993; Williams & Clark, 1998;).

Drinking problems and reasons for drinking. Drinking problems may include such things as: trouble with friends, family, work, or the law, blackouts, hangovers, guilt, depression, withdrawal, regretted actions, or the extent to which one is considered a "problem drinker" (Lo, 1996; McKay et al., 1992; Sadava, 1985; West et al., 1990; Weinberger & Bartholomew, 1996). Reasons for drinking have been found to be significant predictors of alcohol-related problems (e.g., Carey & Correia, 1997; Donovan & Marlatt, 1982; Hughes et al., 1992; McKay et al., 1992). Furthermore, negatively reinforcing reasons for drinking have been found to predict alcohol-related problems, even after controlling for consumption (e.g., Carey & Correia, 1997; Hughes et al., 1992; McKay et al., 1992; West et al., 1990; Weinberger & Bartholomew, 1996; Wood et al., 1992). That is, with the same level consumption, those who report drinking for

negatively reinforcing reasons tend to have more problems from drinking than those who report drinking for positively reinforcing reasons. As a result, it was hypothesized that reasons for drinking help to account for differences in drinking problems that cannot be explained by levels of consumption.

Reasons for Limiting Drinking

The use of reasons for limiting drinking, as predictors of drinking behaviour, is relatively new and research support is limited (Greenfield, Guydish, & Temple, 1989; Johnson, Schwitters, Wilson, Nagoshi & McClearn, 1985; Slicker, 1997; Temple, 1986). Given that drinking alcohol has been associated with both positive and negative outcomes, it is important to study reasons for limiting drinking as independent motivations influencing consumption. In fact, reasons for limiting drinking have been found to predict consumption and alcohol problems; however, evidence of their being an independent predictor of drinking problems, beyond their effects on consumption, is less robust (e.g., Greenfield et al., 1989; Slicker, 1997; Temple, 1986; Wood et al., 1992).

The literature has focused on two sets of reasons for limiting drinking: personal and social reasons (Wood et al., 1992). Personal reasons for limiting drinking are associated with mood and/or personal beliefs, and include such reasons as: financial concerns, safety concerns, health concerns, self-reform concerns, personal beliefs, performance concerns, fear of addiction, and control concerns (e.g., Cooper et al., 1995; Hermos et al., 1988; Jung, 1977). Social reasons for limiting drinking are associated with the external situation and/or sanctions and include such reasons as: religious beliefs, friends don't drink, parental/spousal disapproval, and fear of social persecution (e.g., Cooper et al., 1995; Hermos et al., 1988; Jung, 1977).

Alcohol consumption, drinking problems, and reasons for limiting drinking. A general finding is that more reasons for limiting is associated with lower levels of consumption and fewer problems from drinking (Hesselbrock et al., 1987; Greenfield et al., 1989). However, there is evidence that this association is not as strong as the one between more reasons for drinking and heavier consumption and more drinking problems (Hesselbrock et al., 1987; Greenfield et al., 1989). This may be due to the fact that endorsement of some reasons for limiting drinking is actually found to correlate with an increase in alcohol consumption and problems resulting from drinking (Hesselbrock et al., 1987; Slicker, 1997). For example, consumption and drinking problems have been associated with an increase in self-reform reasons for limiting drinking (Hesselbrock et al., 1987; Greenfield et al., 1989). As a result, some reasons for limiting drinking may be a consequence of excessive drinking and/or drinking problems, and thus may predict decreased consumption at a later stage.

Gender Differences in Consumption and Drinking Problems

A review of the literature on alcohol use reveals significant gender differences in consumption and drinking problems (Ferrence, 1984; Hill, 1984). However, there is evidence suggesting a degree of convergence of drinking patterns for men and women, making their differences less clear-cut (Dunne 1990; as cited in Dunne et al., 1993; Thompson & Wilsnack, 1984). Even so, evidence for gender differences in consumption and alcohol problems remain (Hill, 1984; Ferrence, 1984). In addition, the literature reveals gender differences in the importance of positively reinforcing reasons for drinking, negatively reinforcing reasons for drinking, and reasons for limiting drinking

(Dunne et al., 1993; Greenfield et al., 1989). As a result, separate motivational models of problem drinking were developed for men and women, in the current study.

The literature on gender differences in alcohol use reveals that men, on average, consume more alcohol in terms of quantity and frequency than women, even after controlling for body weight and composition (mean body water volume) (e.g., Carey & Correia, 1997; Dunne et al., 1993; Ferrence, 1984; Jung, 1977; O'Callaghan & Callan, 1992; West et al., 1990). In contrast, there is evidence that women are at a greater risk for developing drinking problems than men, with the same level of consumption and within a shorter period of time (Dunne et al., 1993; Ferrence, 1984; Hill, 1984; Schmidt, Klee, & Ames, 1990; Sadava, 1986). In fact, female problem drinkers are found to be at a greater risk for health problems such as brain damage (Jacobson, 1986, as cited in Dunne et al., 1993), cirrhosis of the liver, and alcoholic hepatitis (Hill, 1984; Wilkinson, 1980, as cited in Ferrence, 1984). In addition, there is evidence of greater interpersonal problems such as marital and family dysfunction among female drinkers (Schmidt, Klee, & Ames, 1990). Furthermore, women are found to seek help for problem drinking, with a shorter history of drinking than their male counterparts (Dawson, 1996; Lex, 1990). In sum, although women generally do not drink as much or as often as men, when they drink, it is often associated with a more rapid and a greater onset of problems from drinking.

There is research indicating that men report more drinking problems than women (Engs & Hanson, 1985, as cited in Lo, 1995; Temple, 1986; Thomas, 1995; Wilsnack, Wilsnack & Klassen, 1986; West et al., 1990;). It has proposed that these findings are a consequence of poor methodology and theoretical rationale. For example, some of these

studies have failed to control for level of consumption (Thomas, 1995). Given that men, on average, consume more alcohol than women (e.g., Carey & Correia, 1997; Ferrence, 1984), and given that consumption is moderately correlated with problems from drinking (e.g., Lex et al., 1989; West et al., 1990; Sadava, 1985), it follows that men will have more problems from drinking than women, when consumption is not taken into account. Furthermore, after controlling for consumption, men and women have been found to experience different types of problems from drinking (Lo, 1995, 1996; Lex, 1990; Robbins, 1989, as cited in Lisansky Gomberg & Nirenberg, 1993). For example, men are more likely to experience problems in social functioning, such as problems with the law or with employment, whereas women are more likely to experience intrapsychic problems, such as depression, anxiety, and diminished perceived physical attractiveness (Ferrence, 1980, as cited in White & Huselid, 1997; Pope, Smith, Wayne & Kelleher, 1994). Since the study of alcoholism has been largely focused on the male population (Wilsnack et al., 1986), it is highly likely that the types of problems listed in these studies fail to tap into female-oriented problems (Lo, 1995; White & Huselid, 1997). Furthermore, the social problems typically experienced by male drinkers, may be underreported by female drinkers, due to the social stigma associated with alcohol abuse in women (Garretsen, 1983; as cited in Bongers, Van De Goor, Van Oers & Garretsen, 1998; Robbins, 1989; as cited in White & Huselid, 1997). In summary, evidence that male drinkers experience more alcohol-related problems than female drinkers may be biased due to: failure to control for level of consumption, male-oriented lists of drinking problems, and underreporting of drinking problems by women drinkers.

There is evidence that gender differences in consumption and drinking problems are a consequence of both biological and sociocultural factors (e.g., Ferrence, 1984; Goldman et al., 1987; Hill, 1984; Jacobson, 1986, as cited in Dunne et al., 1993; Windle & Barnes, 1988). For example, women's physiology has been found to be less efficient in metabolizing alcohol (Ferrence, 1984), and sanctions for drinking are generally found to be more permissive of excessive drinking among men (Fillmore, 1984). In fact, it is probable that these biological and sociological factors encourage the development of positive alcohol-related expectancies in men, while creating negative alcohol-related expectancies in women. In turn, these alcohol-related expectancies are thought to influence gender differences in reported reasons for drinking, reasons for limiting drinking, and overall drinking patterns.

Biological Factors Contributing to Gender Differences

Due to sex differences in the distribution, absorption, and metabolism of alcohol, consumption of the same amount of alcohol will result in higher blood alcohol levels in women than in men (Ferrence, 1984; Lieber, 1993). In fact, the literature identifies three specific factors contributing to gender differences in blood alcohol levels: body weight and composition, first-pass metabolism, and the menstrual cycle (Ferrence, 1984; Lex, 1990; Lieber, 1993; Schuckit, Daeppen, Tipp, Hesselbrock & Bucholz, 1998). Because women tend to weigh less and have less body fluid than men, alcohol is distributed in a smaller volume of water in women, resulting in higher blood alcohol levels (Ferrence, 1984; Lieber, 1997). In addition, first pass metabolism, which is the metabolism of alcohol in the stomach, is found to be less efficient in women, resulting in the absorption of more alcohol into the bloodstream (Graham, Wilsnack, Dawson & Vogeltanz, 1998;

Lieber, 1993). Furthermore, alcohol consumption in the luteal phase of the menstrual cycle, after ovulation and before menstruation, is associated with higher blood alcohol levels, due to different rates of metabolism and absorption (Van Thiel & Gaqvaler, 1988, as cited in Lex, 1990; Lieber, 1997).

The inefficacy of the metabolism of alcohol, in women, may be contributing to the higher incident of drinking problems, among women who are heavy drinkers. In fact, there is evidence that a greater risk of intoxication among women is related to an increase in health problems related to drinking (Lieber, 1997). Furthermore, women may be at a greater risk of suffering from safety hazards and social problems, due to an increased likelihood of intoxication and loss of control while consuming alcohol.

Sociocultural Factors Contributing to Gender Differences

Although biological factors help to account for gender differences in drinking behaviours and consequences, sociocultural factors also contribute to the distinctive drinking patterns of men and women (Ferrence, 1984; Timmer, Veroff & Colten, 1985). These sociocultural factors include sanctions for drinking and safety concerns while drinking.

Sanctions for drinking. There is evidence indicating that gender differences in alcohol use and drinking problems stem from differential socialization and sanctions for drinking (Fillmore, 1984). For example, the same norms encouraging heavy drinking in men, discourage it among women (Ferrence, 1984; Lemle, 1984; as cited in Biener, 1987). Following this, it has been found that women high in egocentrism report the lowest consumption of alcohol, while men high in egocentrism report the highest consumption of alcohol (Gross & Billingham, 1990). Since higher levels of egocentrism

may indicate greater concern about what others may think of him or her (Gross & Billingham, 1990), these findings may be indicative of gendered norms. For example, men scoring high in egocentrism may be socialized to see heavy drinking as masculine and desirable, and therefore, drink more to impress others. On the other hand, women high in egocentrism may be concerned of what others may think if they drink too much, and thus, choose to limit their drinking.

For men, heavy drinking is associated with the expression of masculinity, and is a popular way of socializing with same-sex friends (Lemle, 1984, as cited in Biener, 1987). Conversely, women have been socialized to see excessive drinking as shameful. For example, female alcoholics are more likely to drink alone at home and to be hidden by their families, than their male counterparts (Dunne et al., 1993). In fact, even moderate drinking in women has been associated with a reported decrease in self-esteem, whereas in men it has been associated with a reported increase in self-esteem (Orford & Keddie, 1985). It has been suggested that this sense of shame and guilt in women comes from imposed social sanctions, dictating that drunkenness in women is unfeminine and socially undesirable (e.g., Alvarez & del Rio, 1994; Cox, 1987; Dunne et al., 1993; Fillmore, 1984; Nadeau & Harvey, 1997; Chassin et al., 1985, as cited in White & Huselid, 1997). Furthermore, intoxicated women are often perceived as promiscuous and sexually accessible (Blume, 1997; Corcoran & Thomas, 1991, as cited in Wilsnack, Plaud, Wilsnack & Klassen, 1997). In sum, heavy drinking is considered acceptable for men, whereas this type of behaviour is not perceived as desirable for women.

Physical safety. In addition to social sanctions for drinking, men and women may differ in their drinking behaviours because of a different likelihood of danger in drinking

situations. Since women are smaller in stature than men, and are more likely to be targets for unwanted sexual advances and assaults particularly when alcohol is consumed (Timmer et al., 1985; Martin, 1992; as cited in Wilsnack et al., 1997), drinking situations are more threatening to women's physical safety and well-being than they are to men's. This difference likely influences how men and women perceive drinking situations, where women will probably be more cautious. Furthermore, the increased chance of danger in drinking situations may contribute to drinking problems in women.

It has been argued that these biological and sociocultural factors work together to create relatively more positive alcohol-related expectancies among men and more negative alcohol-related expectancies among women. That is, women's biological vulnerability to alcohol (Lieber, 1997), the social stigma associated with drunkenness in women (Goldman et al., 1987), and the physical danger of drinking situations for women (Timmer et al., 1985) are expected to have the effect of increasing negative alcohol-related expectancies among women. Conversely, men are socialized to associate heavy drinking with positive experiences such as social activities and masculinity (Lemle, 1984, as cited in Biener, 1987), which is expected to encourage the development of positive alcohol-related expectancies among men.

Gender and Alcohol-Related Expectancies

There is evidence that women report fewer overall positive expectancies for alcohol's effects than men (Goldman et al., 1987; Orford & Keddie, 1985; Rohsenow, 1983, as cited in Cappell & Greeley, 1987). For example, in an experiment in which participants were asked to create a favourable impression of themselves to an opposite sex confederate, men who believed that they had consumed alcohol became much more

relaxed, whereas women who believed that they had consumed alcohol became much more anxious (Abrams & Wilson, 1979, 1977, as cited in Goldman et al., 1987). The increase in anxiety among women in this experiment may be due to the social stigma associated with drinking in women (Goldman et al., 1987). In addition, since intoxicated women are often targets for sexual assaults (Timmer et al., 1985), it may be adaptive for women to become anxious in a drinking situation with a strange man. In fact, an increase in tension, after drinking in situations that are potentially threatening to one's psychological and/or physical well-being, has been consistently found in the literature (Abrams & Wilson, 1979; as cited in Cappell & Greeley, 1987). Given that women are more vulnerable to psychological and physical danger in drinking situations (Timmer et al., 1985; Blume, 1990), it follows that they would develop more negative and fewer positive alcohol-related expectancies relative to men.

Gender and Reasons

It was hypothesized that alcohol-related expectancies would influence reasons for drinking and reasons for limiting drinking. Given that alcohol-related expectancies and reasons for drinking are correlated (Wood et al., 1992), and since expectancies are more distal determinants of drinking behaviour than reasons (Cronin, 1997), it was hypothesized that gender differences in alcohol-related expectancies contribute to gender differences in reasons for drinking and reasons for limiting drinking.

Reasons for drinking. The reasons for drinking reported by men and women have been found to differ both in terms of the number and types of reasons endorsed (Dunne, et al., 1993; Edwards, Hensman & Peto, 1973). In general, when compared to women, men have been found to report more reasons for drinking as important (Dunne et al.,

1993; Edwards et al., 1973). Furthermore, they are more likely to report more positively reinforcing reasons for drinking than women. On the other hand, men and women are found to be equally likely to report negatively reinforcing reasons for drinking (Beck, Thombs, Mahoney & Fingar, 1995; Orford & Keddy, 1985; Cooper, Frone, Russell & Pierce, 1997). However, in terms of the proportion of reasons endorsed, negatively reinforcing reasons for drinking appear to be more important to women than to men (Beck et al., 1995, Klassen, Wilsnack, Harris & Wilsnack, 1991). For example, women more frequently report family problems and marital instability as reasons for drinking alcohol (Kielholz, 1970, as cited in Lisansky Gomberg & Lisansky, 1984; Klassen et al., 1991). Furthermore, drinking for the purpose of relieving emotional pain appears to be more important to women than to men (Beck et al., 1995). In fact, there is evidence of a stronger relationship between negatively reinforcing reasons for drinking and drinking problems, among women than among men (Carman & Holmgren, 1986; Windle & Barnes, 1988; Cooper, Russell, Skinner & Windle, 1992, as cited in Bradizza et al., 1999). It was, therefore, hypothesized that negatively reinforcing reasons for drinking would be better predictors of women's drinking behavior, than of men's drinking behavior (Stewart & Zeitlin, 1995). Conversely, since positively reinforcing reasons for drinking are more frequently reported by men (Dunne et al., 1993; Edwards et al., 1973), it is hypothesized that they will be better predictors of men's drinking behavior, than of women's drinking behavior. Note that the greater frequency of positively reinforcing reasons for drinking among men is in accordance with the greater frequency of positive alcohol-related expectancies among men.

Reasons for limiting drinking. In general, women have been found to ascribe more importance to all reasons for limiting drinking, when compared to their male counterparts (Greenfield et al., 1989). This is in accordance with the higher frequency of negative alcohol-related expectancies among women. Perhaps women give more importance to reasons for limiting drinking, because of the greater psychological and physical dangers inherent in or associated with drinking situations for women.

Gender and Drinking Patterns

It was hypothesized that the biological and sociocultural factors culminate in the characteristic drinking patterns of men and women.

Drinking in men. Drinking in men has been associated with socializing with same-sex friends, moderate incidence of alcohol problems, positive attitudes toward heavy consumption, masculinity, strong positive expectancies about the effects of alcohol, and irresponsible drinking (Abbey et al., 1993; Cooper et al., 1992; Edwards et al., 1973; Lemle, 1984, as cited in Biener, 1987; McCarty & Kaye, 1984; Windle & Barnes, 1988). This portrait of male drinking indicates that drinking in men is typically associated with good times and positively reinforcing reasons. Furthermore, the prealcoholic male prototype is not found to drink for negatively reinforcing reasons, but drinks alcohol excessively in an attempt to fulfill impulsive, sensation seeking, rebellious, and aggressive needs (Cox, 1987). As excessive drinking in males is not prohibited by social norms (Lemle, 1984, as cited in Biener, 1987), increased consumption by men could lead to drinking problems. In sum, although drinking in men has been associated with both positively and negatively reinforcing reasons for drinking (Edwards et al., 1973), it appears that problem drinking in men is best characterized by a desire to

increase positive affect, which leads to increased consumption, which eventually leads to an increase in drinking problems.

Drinking in women. Given that limiting drinking is perceived as safe and desirable for women (Fillmore, 1984), it is probable that women will choose to abstain or to limit their drinking (Corrigan, 1985). For example, drinking by female college students has been characterized by lower levels of consumption and alcohol-related problems (McCarty & Kaye, 1984). On the other hand, those women who choose to consume alcohol in heavier amounts, typically suffer from such psychological distress that they will most definitely have problems resulting from their drinking (Nadeau & Harvey, 1997). That is, biological and sociocultural factors create a culture of women, who will most likely drink heavily and develop drinking problems, as a reaction to negative life circumstances and not as a matter of increased consumption (Ratliff & Burkhart, 1984, as cited in White & Huselid, 1997; Roizen et al., 1979, as cited in Fillmore, 1984).

In addition, it was argued that women's reasons for limiting drinking would be dissonant with their consumption of alcohol (Biener, 1987). In fact, this internal conflict has been found to increase stress while drinking (Abrams & Wilson, 1979, as cited in Biener, 1987). Since stress has been related to an increase in drinking problems (Sadava & DeCourville, 1997; Sadava & Pak, 1992), it was hypothesized that this stress would increase the probability of adverse consequences from drinking among women. In sum, it was hypothesized that among female drinkers, more reasons for limiting drinking would be associated with more drinking problems.

Hypotheses

Measurement Models

Reasons for drinking. It was hypothesized that reasons for drinking would be composed of two types of factors: positively reinforcing reasons for drinking and negatively reinforcing reasons for drinking.

Reasons for limiting drinking. Reasons for limiting drinking were hypothesized to be composed of two related factors: personal reasons for limiting drinking and social reasons for limiting drinking.

Problem drinking. It was hypothesized that problem drinking would be composed of two related factors: consumption and drinking problems.

Structural Model

Relationships among latent variables. The motivational model of problem drinking predicted that reasons for drinking and reasons for limiting drinking would be associated with drinking problems through two paths: a direct path to problems, and an indirect path to problems, through level of consumption.

Both positively and negatively reinforcing reasons for drinking were expected to be associated with higher levels of consumption and drinking problems, through level of consumption. In addition, negatively reinforcing reasons were expected to be associated with drinking problems directly, independent of the level of consumption.

It was hypothesized that reasons for limiting drinking would predict alcohol consumption and its subsequent problems. In particular, more reasons endorsed for limiting drinking was predicted to be associated with lower levels of consumption and lower levels of problems, through consumption. In addition, the motivational model of

problem drinking for women predicted that an increase in reported reasons for limiting drinking would be associated with an increase in drinking problems, independent of level of consumption.

Gender differences. Differences in the strengths of specific regression paths were expected. It was hypothesized that the paths from negatively reinforcing reasons for drinking to drinking problems, and from reasons for limiting drinking to consumption, would be stronger for women than for men. In addition, the paths from positively reinforcing reasons for drinking to consumption, and from consumption to drinking problems, were predicted to be stronger for men than for women.

Method

Participants

The hypotheses were tested using a sample from the Niagara Young Adult Health Study (NYAHS) (conducted by Sadava). The NYAHS is a longitudinal study, consisting of two phases separated by approximately five years (1991 and 1996).

The original sample was obtained through random digit dialing, and was comprised of 843 participants. The selection criteria required the participants to be between the ages of 20 and 29 years, during the first phase of the study. For the second phase, 715 of the original participants were contacted. After numerous attempts at getting questionnaires completed and returned, 574 questionnaires were received, a sample retention of 68%. In addition, a supplementary community sample of 239 participants was obtained, making a total sample of 813 participants for the second phase of the study. It is this sample of 813 participants, which was used to test the proposed motivational models of problem drinking.

Given that this study tested motivational models of problem drinking, it was necessary to identify and exclude non-drinkers from the sample. Non-drinkers were identified, by a score of zero on the product of two items, quantity of alcohol typically consumed and frequency of consumption. After the non-drinkers were removed from the sample, 742 participants remained (316 men and 426 women).

Tables 1 and 2 report descriptive statistics and frequency analyses of the variables used to describe the sample of drinkers.

Table 1. Descriptive Statistics for Quantitative Variables

Variables		Men	Women
Age	M	28.07	28.03
	SD	4.71	4.85
	n	311	422
Level of education	M	5.54	5.56
	SD	2.17	1.90
	n	190	286
Own annual income	M	29 500	18 300
	SD	2.16	1.59
	n	294	405
Family annual income	M	52 000	56 600
	SD	2.65	2.46
	n	201	296
Number of children	M	0.67	1.01
	SD	1.04	1.17
	n	299	415

Note: A higher number indicates: older age, higher level of education, higher own and family income, and more children.

Table 2. Percentages of the Categorical Variables

Variables	Categories	Men (%)	Women (%)
Attendance at religious services	once a week or more	9.2	10.6
Employment	full-time	63.6	43.8
	part-time	10.7	18.5
	unemployed	8.5	9.9
	attending school	9.4	10.8
Marital status	married	39.9	48.6
	engaged or in a serious relationship	25.7	29.1
	separated or divorced	5.1	4.7
	unattached	28.5	16.7
Residence	with parents or family	25.9	17.1
	in residence, an apartment or a house	26.2	18.8
	with a partner	43.7	54.5

Measures

The measures used to test the hypothesized models are presented in Appendix A. Some of the measures used were composite variables, created by calculating a participant's average score on a number of items. The items making up a composite variable were evaluated for internal consistency, using Cronbach's Alpha, where alpha values above .60 were considered acceptable (Cohen & Cohen, 1983).

Consumption. Consumption of alcohol was evaluated using three measures: quantity of alcohol typically consumed, frequency of consumption, and frequency of intoxication. Both quantity and frequency of consumption were single item indicators, with 10-point scales ranging from 'nothing' to 'more than 7 drinks', and 'never' to 'more than once a day', respectively. Frequency of intoxication was a composite variable, calculated from the average of three items: frequency of feeling high, frequency of feeling unsteady on feet, and frequency of feeling drunk (in the past year). These items were measured on 8-point scales, ranging from '0' to '7' (more than 11-12 times in the past year). The internal consistency of 'frequency of intoxication' was excellent, with Cronbach's alphas of .89 and .90, for men and women respectively

Drinking problems. Three composite variables were used as indicators of drinking problems: preoccupation with drinking, symptoms of problem drinking, and adverse consequences from drinking. The composite variable, preoccupation with drinking, was calculated by averaging the following items for each participant: frequently talks about alcohol, frequently thinks about alcohol, tries to keep a supply of alcoholic beverages on hand, prefers parties with alcohol, and always chooses a restaurant that serves alcohol. These items were assessed using a 4-point scale ranging

from 'not at all like me' to 'quite a bit like me'. Cronbach's alpha for 'preoccupation with drinking' was good (.78 for men and .70 for women).

The following items were averaged to form the composite variable, symptoms of problem drinking: number of times binged in the past year, feeling guilty after drinking, can stop drinking whenever one wants, restrained drinking only in front of others, and tossed down several drinks for a quick effect. The first four items were measured on 4-point scales, ranging from 'never' to 'more than twice', 'never' to 'always', 'always' to 'often cannot stop', and 'never' to 'always', respectively. Tossed down several drinks for a quick effect was measured on a 5- point scale, ranging from 'never' to 'most days'. When assessed for internal consistency, symptoms of problem drinking proved to be an adequate composite variable for both men and women (Cronbach's alpha of .71 and .68 respectively).

Finally, the composite variable, adverse consequences from drinking, was made up of thirty-five items, assessing the frequency of certain negative consequences from drinking in the past year (White, 1987). All items were measured on a 4-point scale, ranging from 'never' to 'more than 5 times'. As a composite variable, adverse consequences from drinking was internally consistent for both male and female drinkers (Cronbach's alphas of .93 and .93 respectively).

Reasons for drinking and reasons for limiting drinking. Reasons for drinking were assessed using 18 items on a 4-point response scale, ranging from 'not at all important' to 'very important'. These items were the following: to have a good time, because I'm expected to, to have wine with meals, helps get over changes, eases pain, to feel more satisfied with myself, to forget stresses, to get my mind off problems, to forget

I'm not the person I'd like to be, to worry less, to sleep, to relieve boredom, makes me feel sexier, for special occasions, like the taste, makes it easier to talk to people, feel more powerful, cheers me up. Reasons for limiting drinking were assessed using 12 items and a 4-point response scale, also ranging from 'not at all important' to 'very important': tastes bad, leads to being loud and aggressive, against my religion, friends are against it, bad habit, bad for health, artificial way of solving problems, leads to trouble with the law, don't want to lose self-control, bad hangovers, fear of losing control over drinking, and seen damage it does to others. The items used to assess reasons for drinking and reasons for limiting drinking were similar to the items used in the Schlegel longitudinal study carried out at the University of Waterloo (Schlegel, DeCourville, D'Avernas, Manske, & Ebbeson, 1991).

Descriptive statistics on the measures were calculated, and a MANOVA was conducted to see if the resulting variables differed by sex. The results of the MANOVA were significant (F (6,735)=22.56, $p < .000$), indicating that the set of measures differed by sex. Independent samples t-tests were conducted, using the Bonferroni procedure to correct for the number of comparisons made (Miller, 1966; as cited in Pedhazur, 1997). A probability value of .008 (.05/6), was used to determine significance for each comparison. The results of these analyses are presented in Table 3.

Table 3. Descriptive Statistics and t-Values of the Measures

Measures		Men n = 316	Women n = 426	t
Quantity consumed	M	6.35	5.31	8.78 *
	SD	1.63	1.58	
Frequency of consumption	M	4.18	2.94	9.38 *
	SD	1.86	1.72	
Frequency of intoxication	M	4.04	2.71	8.66 *
	SD	2.33	1.85	
Preoccupation with drinking	M	1.53	1.24	8.62 *
	SD	0.56	0.38	
Symptoms of problem drinking	M	1.48	1.26	6.40 *
	SD	0.55	0.40	
Adverse consequences	M	1.27	1.15	6.02 *
	SD	0.31	0.23	

Note: * = $p < .008$

A higher score on all measures indicates greater involvement and/or problems with alcohol.

The independent t-tests revealed that all measures for men and women were significantly different. The means of the measures indicate that men reported drinking more alcohol (both in terms of quantity and frequency), getting intoxicated more frequently, being more preoccupied with drinking, showing more symptoms of problem drinking, and having a greater number of adverse consequences of drinking.

Analytic Procedure

The motivational models of problem drinking for men and women were analyzed using a two-step structural equation modeling process. This involved testing the measurement and structural models separately (Kline, 1998). The rationale for using the two-step method, when testing complete structural models is as follows: If the measurement and structural portions of a complete structural model are analyzed simultaneously and the results indicate an overall poor fit, it is not known whether the poor fit is due to misspecified measurement models, structural models, or both (Anderson & Gerbing, 1988, as cited in Kline, 1998). As a result, the complete structural model was specified as a series of measurement models and each was tested for goodness of fit. When the goodness of fit of the measurement models had been determined, the fit of the complete structural model was tested. If the fit of the complete structural model was poor, it could be attributed to misspecification of the structural model.

Finally, sex differences in the measurement and structural models were analyzed through the imposition of cross-group equality constraints (Bentler, 1989; Kline, 1998). Cross-group equality constraints force the program to derive equal estimates of the constrained parameters for both groups. For the measurement models, this involved constraining the factor loadings to be equal, whereas for the structural model, the path

coefficients were constrained to be equal. The fit of the constrained model was compared to that of the unconstrained model, to determine if there was a significant difference (Kline, 1998). If there was a significant difference, and the unconstrained model provided a better fit, the hypothesized model was said to differ across sex. Comparisons were then made between specific parameters, to determine the sex differences in the model.

Design

The hypothesized measurement and structural models were the same for men and women, except where otherwise specified.

Measurement Models

Confirmatory factor analyses (CFA) were conducted on these measurement models, reasons for drinking, reasons for limiting drinking, and problem drinking, with the intention of revealing six latent variables: positively reinforcing reasons for drinking, negatively reinforcing reasons for drinking, personal reasons for limiting drinking, social reasons for limiting drinking, consumption, and drinking problems. All hypothesized loadings of the observed variables on the latent variables were derived from the literature on drinking (e.g., Cox & Klinger, 1988; DeCourville & Sadava, 1997; Sadava, 1985; Slicker, 1997; Stewart et al., 1996; Temple, 1986;).

Overview of measurement models. The observed variables in the hypothesized measurement models were effect indicators, as it was assumed that they were caused by the latent variables (Kline, 1998). Furthermore, all observed variables have measurement errors, which represent the variance in the observed variable that is not accounted for by the latent variable (Kline, 1998; Byrne, 1994). Finally, all of the hypothesized

measurement models were unidimensional, because each observed variable loaded on only one factor (no cross-loadings) and there were no correlated measurement errors (Kline, 1998).

A model must be over-identified, for it to be statistically testable (Byrne, 1994; Kline, 1998). All measurement models, in this study, met the requirements for over-identification in a unidimensional model. The requirements for over-identification, in a unidimensional measurement model, are having fewer estimable parameters[1] than total parameters[2], having scaled latent variables, and having more than two indicators for each latent variable (Kline, 1998).

As indicated above, one of the necessary conditions for identification is that the latent variables be scaled (Kline, 1998). Latent variables are not measured directly; scaling them gives them a metric and a way of interpreting their relationships to other variables in the model. The latent variables were scaled by fixing the regression path, to one of their observed variables at 1.0. This method of scaling gives each latent variable the same metric as the chosen observed variable (Kline, 1998). It should be noted that the regression path, fixed at 1.0, is arbitrary and does not affect the results.

In addition, the regression paths from the measurement errors to the observed variables were fixed at 1.0. This was done to scale the measurement error term and to decrease the number of parameters to be estimated (Kline, 1998; Byrne, 1994). Fixing these regression paths at 1.0, also allowed for the estimation of the variances of the measurement errors. In addition, the covariances and variances of the latent variables were also estimated.

Finally, figures depicting the measurement models will be presented throughout this section. Several conventions have been developed to convey features of the models, without requiring detailed knowledge of the statistical procedures (Newcomb, 1990). For example, typically small circles represent measurement errors, rectangles represent observed variables, and ellipses represent the latent variables. In addition, single-headed arrows are used to indicate regression paths and double-headed, curved arrows are used to indicate covariances between variables. These conventions were used in the diagrams of the hypothesized models.

Reasons for drinking. It was hypothesized that reasons for drinking would be composed of two main factors: positively reinforcing reasons and negatively reinforcing reasons. The hypothesized measurement model of reasons for drinking is depicted in Figure 3.

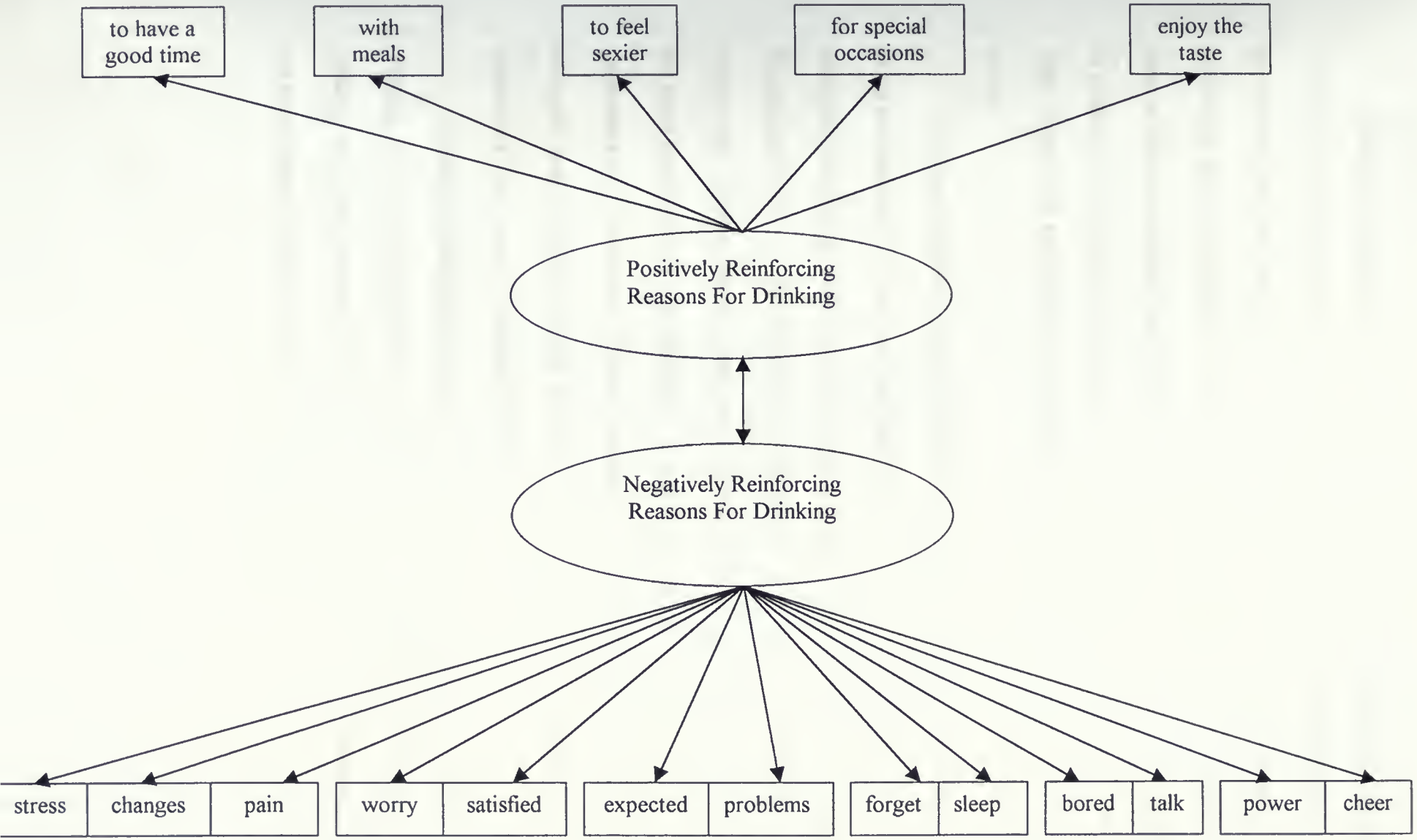

Figure 3. Measurement model of reasons for drinking.

Observed variables used to indicate positively reinforcing reasons, included the following: to have a good time, to have wine with meals, makes me feel sexier, for special occasions, and enjoy the taste. Observed variables used to indicate negatively reinforcing reasons, included: because I'm expected to, helps me get over changes, eases pain, to feel more satisfied with myself, to forget stresses, to get my mind off problems, to forget I'm not the person I'd like to be, to worry less about what others will think, to sleep, to deal with boredom, facilitates talking, makes me feel more powerful, and cheers me up.

The latent variable, positively reinforcing reasons for drinking, was scaled by fixing the loading of 'to have wine with meals' at 1.0; whereas, the latent factor, negatively reinforcing reasons for drinking, was scaled by constraining the path 'because I'm expected to' at 1.0. After fixing two regression paths at 1.0, 16 regression paths were free to vary. Eighteen measurement error variances, and the covariance and variances of the latent variables were also estimated. In sum, this measurement model had 37 parameters to be estimated: 18 measurement error variances, 16 factor loadings, 2 factor variances, and 1 factor covariance. With 171 total parameters and 37 estimable parameters, there were 134 degrees of freedom[3].

Reasons for limiting drinking. It was hypothesized that reasons for limiting drinking would be composed of two latent variables: personal reasons for limiting drinking and social reasons for limiting drinking. Figure 4 is a visual representation of the measurement model of reasons for limiting drinking.

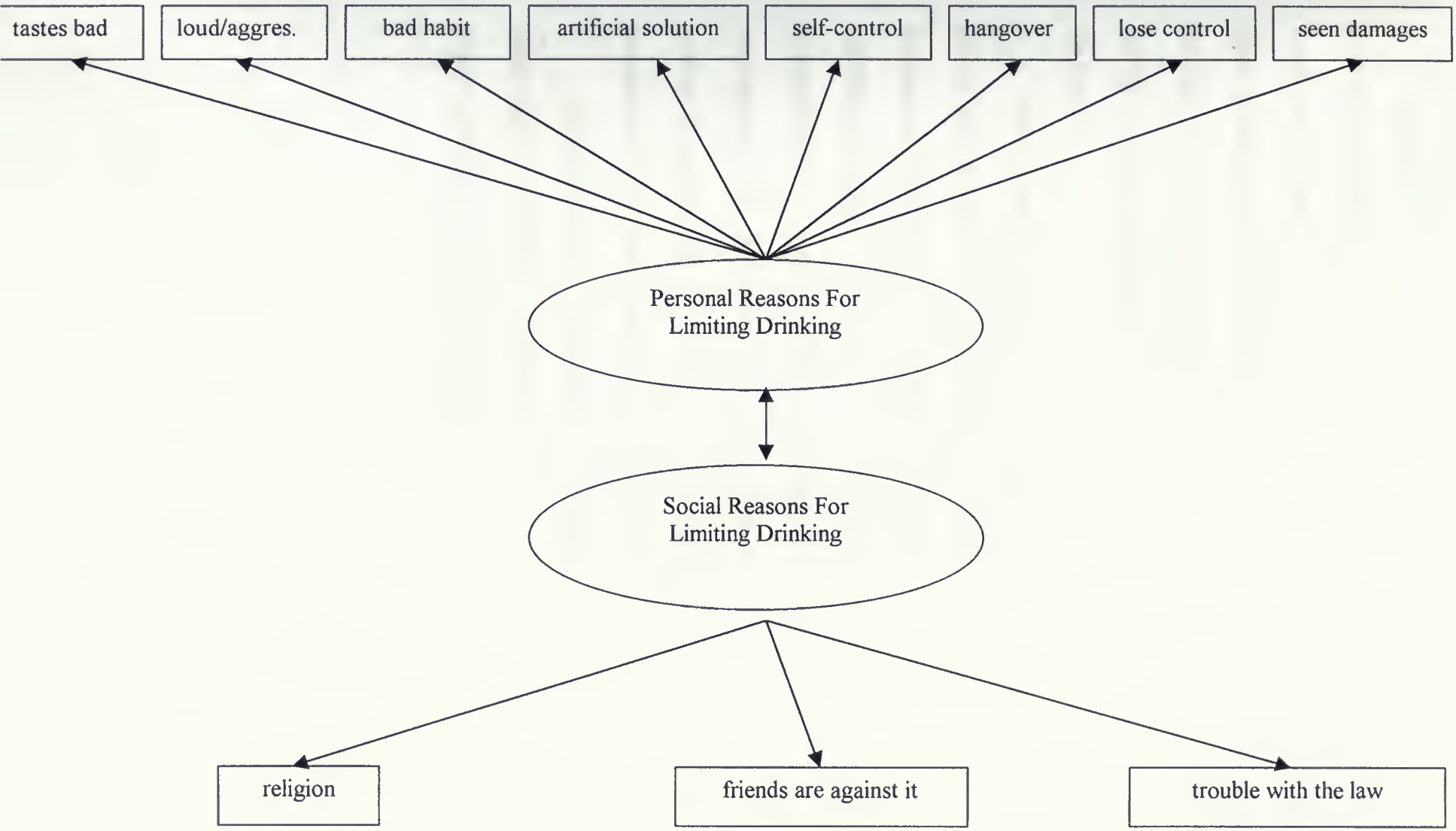

Figure 4. Measurement model of reasons for limiting drinking

The following observed variables were hypothesized to load on personal reasons for limiting drinking: tastes bad, leads to being loud and aggressive, bad habit, bad for health, artificial way of solving problems, don't want to lose self-control, sick/hangover, afraid of losing control over drinking, and seen the damages it does to others. These were the observed variables, hypothesized to load on social reasons for limiting drinking: against my religion, people I hang around with are against it, and can lead to trouble with the law.

In the interest of scaling personal reasons for limiting drinking, the regression path to 'seen damages to others' was fixed at 1.0. For social reasons for limiting drinking, the regression path to 'against my religion' was fixed at 1.0. After fixing two of the regression paths at 1.0, 10 regression paths were free to vary. Furthermore, 12 measurement error variances, and the covariance and variances of the latent variables were also estimated. This makes 25 estimable parameters: 12 error variances, 10 factor loadings, 2 variances and 1 covariance. Since the model had 78 total parameters and 25 parameters to be estimated, there were 53 degrees of freedom.

Problem drinking. Problem drinking was operationalized as consisting of two related factors, consumption and drinking problems. Figure 5 depicts the hypothesized measurement model for problem drinking.

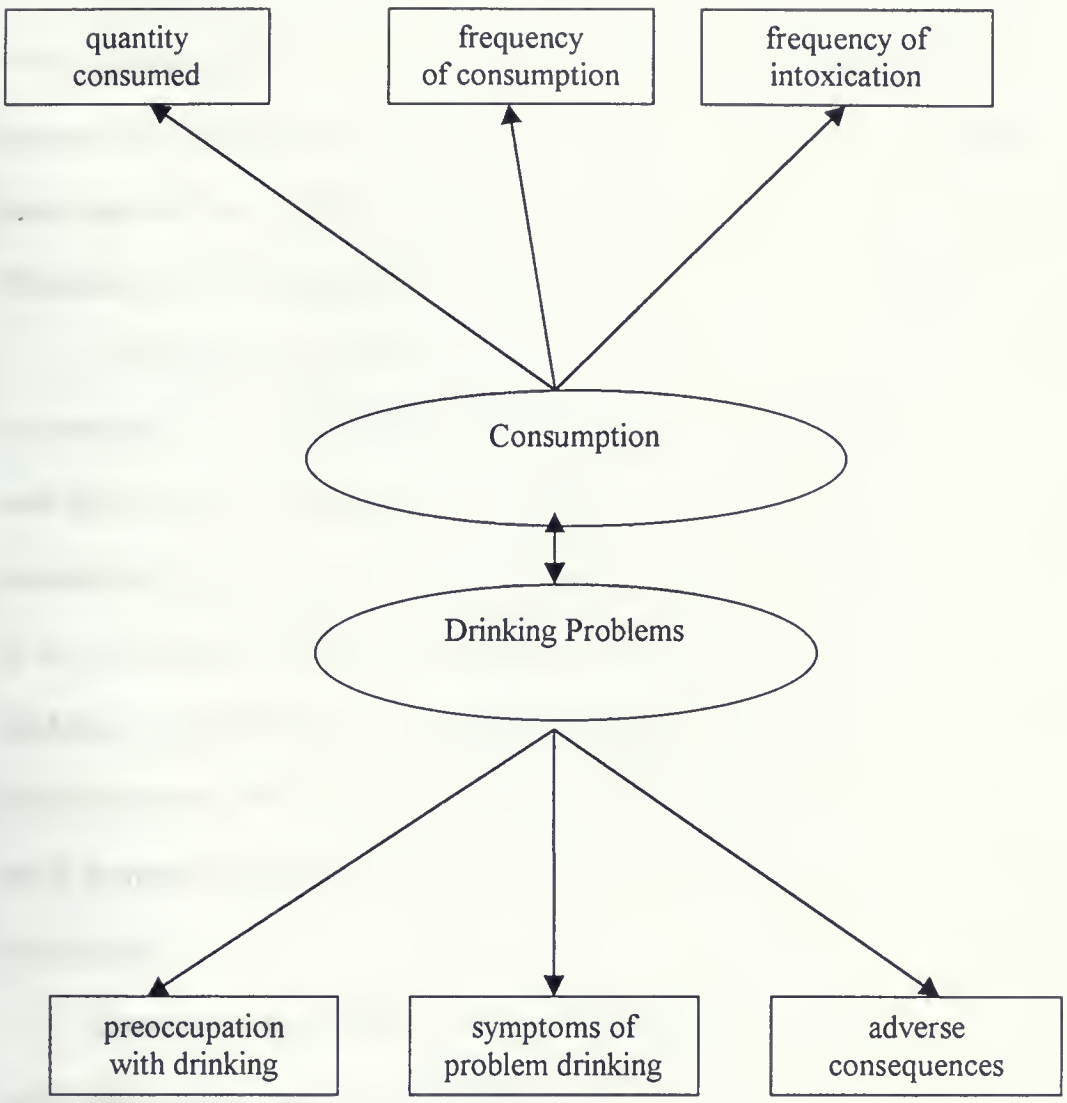

Figure 5. Measurement model of problem drinking.

The following observed variables were hypothesized to load on the latent variable, consumption: quantity of alcohol typically consumed, frequency of consumption, and frequency of intoxication. The observed variables indicating preoccupation with drinking, symptoms of problem drinking, and adverse consequences from drinking were hypothesized to load on the latent variable, drinking problems.

Consumption was scaled, by fixing the regression path to 'frequency of consumption' at 1.0. Drinking Problems was scaled, by fixing the path to 'preoccupation with drinking' at 1.0. This left 4 regression paths to be estimated. In addition, 6 measurement error variances, 2 factor variances, and 1 factor covariance were estimated. In sum, there were 13 estimable parameters for the measurement model of problem drinking: 6 measurement error variances, 4 regression paths, 2 factor variances, and 1 factor covariance. With 21 total parameters and 13 parameters to be estimated, the model had 8 degrees of freedom.

Path Model

Overview of path models. The path model describes the hypothesized relationships among latent variables (Bentler, 1989). There are two types of path models: recursive and non-recursive (Kline, 1998). The path model tested in this analysis is recursive, as it has no correlated disturbances and only unidirectional causal effects. Conversely, non-recursive models may have correlated disturbances and/or feedback loops. Furthermore, given that the hypothesized path model is a recursive model, it is automatically an identified model (Kline, 1998).

Path models are made up of two types of variables: exogeneous and endogeneous (Byrne, 1994; Kline, 1998). Exogeneous variables are variables whose causes are not

represented in the path model, and whose variances are proposed to have effects on the endogeneous variables. As a result, the variances of the exogeneous variables are free to vary and covary. Conversely, the variances of the endogeneous variables are represented as caused by other variables in the model (exogeneous, endogeneous, disturbances), and as a result, their variances are not free to vary or covary (Kline, 1998). In the hypothesized model, the latent variables, positively reinforcing reasons for drinking, negatively reinforcing reasons for drinking, personal reasons for limiting drinking, and social reasons for limiting drinking were exogeneous variables, whereas, consumption and drinking problems were endogeneous variables.

In addition, much like the measurement errors in measurement models, there are disturbances in path models. Disturbances are the proportions of variance in the endogeneous variables that are not explained by the model (Kline, 1998). The regression paths from the disturbances to the endogeneous variables were constrained to 1.0. This was done to scale the disturbances and to reduce the number of parameters to be estimated (Kline, 1998). Fixing these paths at 1.0, also allowed the variances of the disturbances to be estimated (Kline, 1998).

Figures are also used to convey the hypotheses of path models (Newcomb, 1990). Most of the conventions used are the same as those developed for measurement models. For example, ellipses represent latent variables, rectangles represent observed variables, one-headed arrows represent direct regression effects, and two-headed, curved arrows indicate covariances among the variables. An additional convention is the use of small circles to represent disturbances.

The hypothesized path model. Figures 6 and 7 depict the hypothesized relationships among latent variables, for men and women, respectively. Note that these models are only schemata of the complete structural models, as they do not describe the origin of the latent variables.

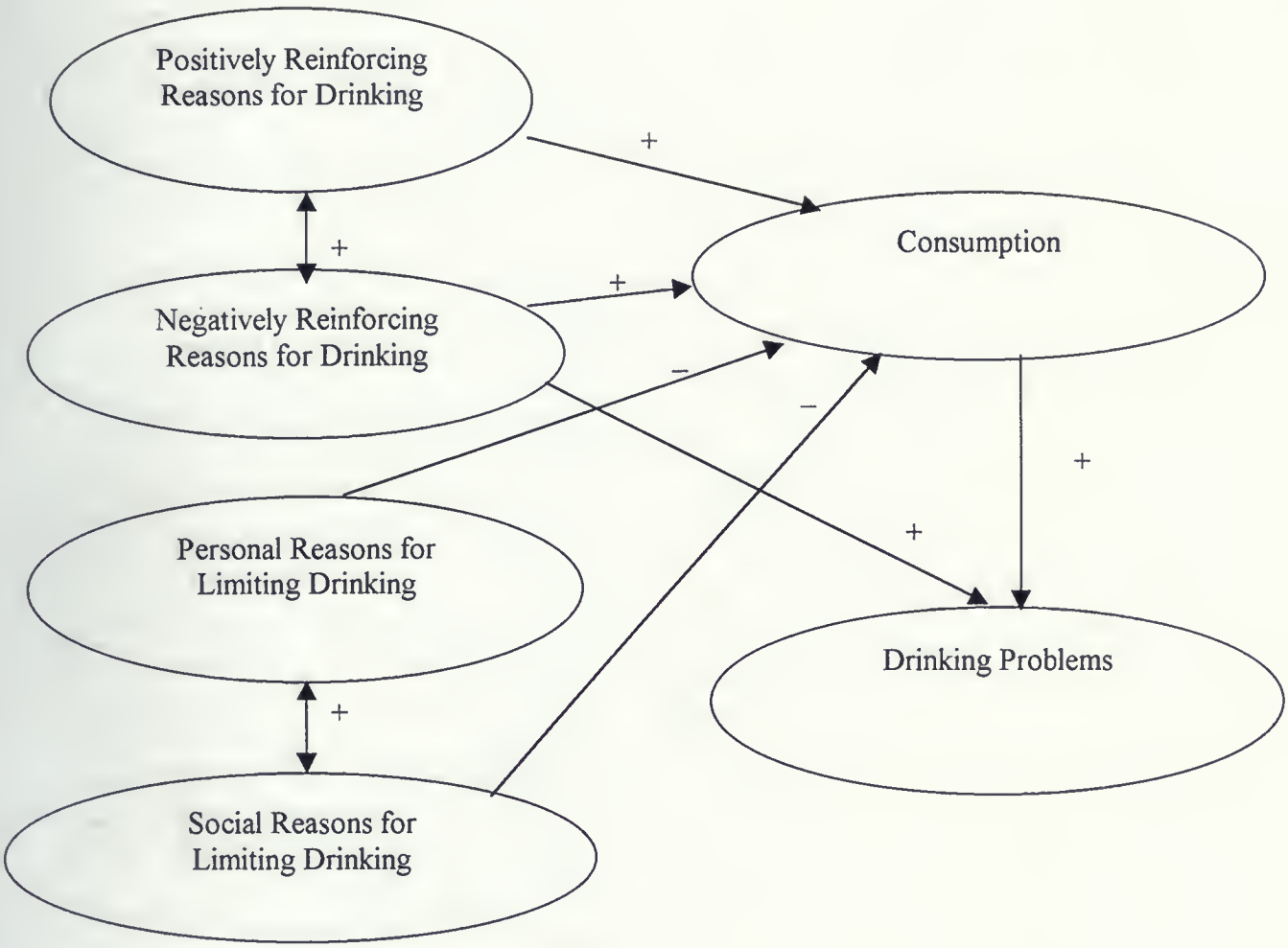

Figure 6. Path model of the relationships between reasons and problem drinking - men.

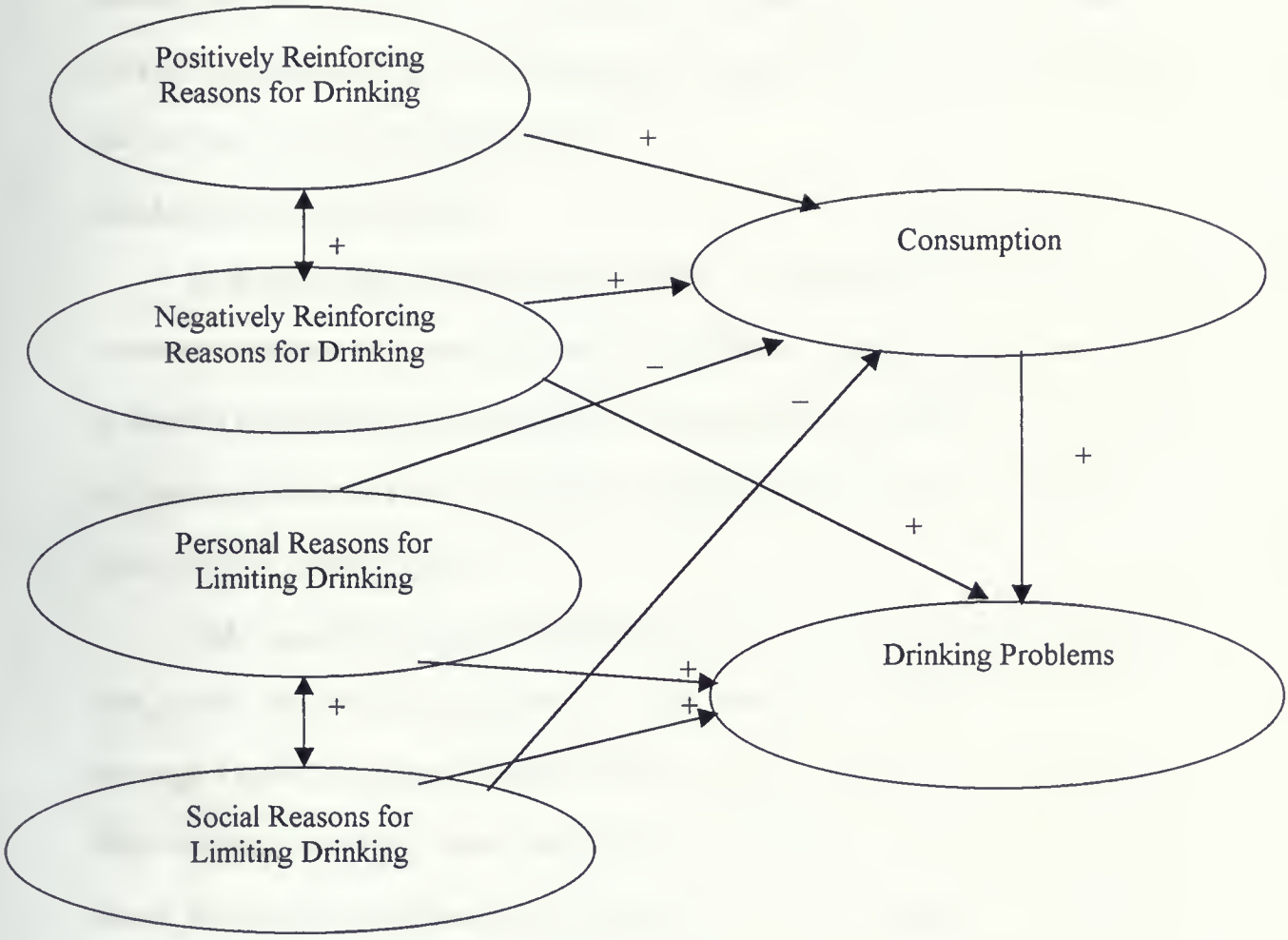

Figure 7. Path model of the relationships between reasons and problem drinking - women.

Positive regression paths were hypothesized from both positively and negatively reinforcing reasons for drinking to consumption. Positive regression paths were also hypothesized from consumption to drinking problems, and from negatively reinforcing reasons to drinking problems. Negative regression paths were hypothesized from both personal and social reasons for limiting drinking to consumption. Finally, for women only, positive regression paths were hypothesized from both personal and social reasons for limiting drinking to drinking problems.

The Complete Structural Model

Overview of the complete structural model. The complete structural model is a synthesis of the above measurement and structural models described above (Kline, 1998). It has both the reduced measurement error of the measurement models and the hypothesis testing capabilities of the structural model. Complete structural models are essentially path models with latent variables.

The motivational model of problem drinking. The complete structural model, for men, had 80 parameters to be estimated: 36 measurement error variances, 30 factor loadings, 4 factor variances, 2 factor covariances, 6 path coefficients, and 2 disturbances. With 666 total parameters, there were 586 degrees of freedom. The complete structural model, for women, had 82 parameters to be estimated: 36 measurement error variances, 30 factor loadings, 4 factor variances, 2 factor covariances, 8 path coefficients, and 2 disturbances. With 666 total parameters, there were 584 degrees of freedom. Both complete structural models had a positive number of degrees of freedom, scaled latent variables, and more than two indicators per factor. These are the requirements for over-identification in a measurement model; however, there is an additional requirement for

the identification of a complete structural model (Kline, 1998). For a complete structural model to be identified, all of its measurement models and its path model must be uniquely identified (Kline, 1998). This was confirmed in the sections 'Measurement Models' and 'Path Model'. Consequently, the complete structural models for men and women were over-identified and therefore, testable (Byrne, 1994; Kline, 1998).

Analyses

Preliminary Analyses

The NYAHS database is large, therefore a thorough screening of possible problems with the data was necessary. Due to the fact that the data were grouped by gender, data screening was conducted separately for men and women (Kline, 1998).

Descriptive statistics, frequency analyses, and distributions of the single-item and composite variables were obtained, to identify inaccurate data entry, outliers, non-normality, and heterogeneity of the data. The following statistics were examined for each variable: mean, standard deviation, minimum value, maximum value, skewness, kurtosis, frequency, and frequency distributions. All variables appeared to be relatively normally distributed for both men and women.

Given that multicollinearity can cause a sample covariance matrix to be non-positive definite and therefore unanalyzable (Kline, 1998), bivariate and multivariate multicollinearity were assessed. A correlation matrix of all variables was obtained to assess bivariate multicollinearity among the variables. Multivariate multicollinearity was assessed, by conducting multiple squared correlations, between each variable and all of the other variables. Bivariate correlations above .85 were used to indicate bivariate multicollinearity, whereas multiple squared correlations above .90 were used to indicate

multivariate multicollinearity (Kline, 1998). The analyses revealed that the data free of both bivariate and multivariate multicollinearity.

Frequency analyses of the missing data were calculated for all items to be used alone or in composite variables. Four single-item variables were removed from the analyses, because of a high incidence of missing data. Among these items were three reasons for limiting drinking: 'I am or may be pregnant', 'I am a recovering alcoholic', and 'It sets a good example for the kids'. These items had 123, 89, and 49 missing cases respectively. It is likely that many participants did not answer these questions because they were not personally relevant. An item from the list of adverse consequences was also removed. This item was an 'Other' question, where the participants had a chance to list additional adverse consequences from drinking that had not been listed previously. This item had 356 missing cases.

As confirmatory factor analysis requires a dataset with no missing data, all missing data were replaced by the mean of that item for men and women. This was done to save degrees of freedom, without changing relationships among variables (Cohen & Cohen, 1983).

Finally, value indices of multivariate kurtosis (Mardia, 1970, 1974; as cited in Bentler, 1989) and case numbers contributing the most to multivariate kurtosis were obtained from the EQS output, and were used to indicate multivariate kurtosis and multivariate outliers.

Estimation Methods and Fit Indices

The following discussion of estimation methods and fit indices, apply to the evaluation of both measurement and structural models.

Maximum likelihood (ML) estimation and robust statistics were used to analyze the measurement and structural models. ML, the default estimation method, assumes multivariate normality of the data (Kline, 1998). When ML is used on severely non-normal data, the hypothesized model is rejected too often. Additionally, because estimates of standard errors on non-normal data tend to be too small, individual parameters are significant too often (Kline, 1998). Robust statistics correct for possible violations in the distributional assumptions of the variables, by rescaling chi-square values and calculating robust standard errors (Bentler, 1989; Kline, 1998). Therefore, similar results obtained using ML and robust statistics were used to indicate multivariate normality of the data. It should be noted, however, that in multi-sample analysis, robust computation was not possible (Bentler, 1989).

The Pearson chi-square is an important indicator of a model's fit (Kline, 1998), and is considered the most basic fit index. The chi-square is a test of the significance of the difference between the hypothesized model and a just-identified version of it, where all of the parameters are free to vary (Kline, 1998). If the chi-square is not significant, the hypothesized model is not statistically different from its just-identified version, and is a good fit for the data. Conversely, if the chi-square is significant, then the fit of the hypothesized model is significantly worse than the just-identified model, indicating a poor overall fit. It should be noted that the chi-square value is sensitive to sample size, causing an increase in Type 1 errors with large samples (Kline, 1998). A correction for

this bias involves calculating the ratio of chi-square to degrees of freedom, with a value of less than 3 indicating a good fit (Kline, 1998). This correction is only appropriate for large samples. Since the sample available for this study (NYAHS) was large (742 participants), the ratio of chi-square to degrees of freedom with a value of less than 3 was used to indicate goodness of fit. Note that a ratio of less than 3 is somewhat arbitrary, as others have used a ratio of less than 5.0 as the appropriate cut-off (Wheaton, Muthen, Alwin, & Summers, 1977, as cited in DeCourville & Sadava, 1997).

Four other indices were used to evaluate the goodness of fit of the hypothesized models: the 'Bentler-Bonett Normed Fit Index' (NFI), the 'Bentler-Bonett Nonormed Fit Index' (NNFI), the 'Comparative Fit Index' (CFI), and the robust CFI. The NFI indicates the proportion of improvement of the hypothesized model over the null model, in which the variables are independent (Kline, 1998). The NNFI gives the same information as the NFI, but is corrected for complexity of the model. That is, the value of the NNFI is corrected downward for models with more parameters. The CFI gives the same information as the NFI, but is less affected by sample size, since the values of the NFI tend to go down with larger samples. Finally, the robust CFI gives the same information as the NFI, but is corrected for non-normality of the data. Values of the NFI, NNFI, CFI, and robust CFI range from 0 to 1, where a value of .80 indicated that the hypothesized model fit the sample data 80% better than the null model (Kline, 1998). For a good fit of the model, values above .9 are expected for the NFI, NNFI, and CFI (Kline, 1998).

In addition, the 'average off-diagonal absolute standardized residuals' were examined. This statistic is the average of the standardized residuals for the difference between the model-implied covariances and the observed covariances (Kline, 1998). As

the discrepancy between the covariances increases, the value of this statistic increases. Values above .10 are indicative of a poor fit (Kline, 1998). Following this, for a model to be considered a good fit, a distribution of standardized residuals centered at zero is desirable.

Even if the overall fit of the model is satisfactory, components of the model may not adequately represent certain correlations among the variables (Kline, 1998). As a result, the standardized residuals of the difference between the covariance matrices of the hypothesized model and the raw data were examined for values that seemed too large. Values above .10 are indicative of parts of the model that do not adequately explain the associated observed correlation (Kline, 1998). In addition, the significance of all hypothesized paths, covariances, and variances help to indicate the fit of particular parts of the model, where non-significance indicates a poor fit.

Squared multiple correlations of the endogeneous variables were examined for small values. Small squared multiple correlations indicate that only a small part of the endogeneous variables variance is explained by other variables and that a large part of its variance is unique (Kline, 1998).

Support for the hypothesized models was obtained if the majority of fit indices indicated that the model was a good fit to the data. However, if the majority of fit indices indicated that the model was a poor fit to the data, the results of the Wald Test and the Lagrange Multiplier Test were consulted for suggestions on improving the model. Note that only suggestions that made theoretical sense were carried out.

Finally, chi-square difference tests were calculated, to determine whether the overall fit of the measurement and structural models differed for men and women, when

cross-group equality constraints were imposed (Kline, 1998). If the chi-square difference test was significant, the models were judged to be different. Sex differences in relevant regression coefficients were then tested using t-tests.

Results

After the data were screened, CFA was used to test the hypothesized measurement models. These models were evaluated and respecified, so as to represent conceptually and statistically sound latent variables. Following this, the complete structural model with latent variables was evaluated and respecified. All models were analyzed separately for men and women. Finally, cross-group equality constraints were imposed on the revised models, to determine their equivalence for male and female drinkers.

Measurement Models

The hypotheses were tested using archival data, and as a result, observed variables that would have been included in the measurement models were not available. The measurement models were, therefore, analyzed using CFA in an exploratory manner. That is, respecifications of the hypothesized models were made until each provided a satisfactory fit to the data. Only respecifications that were theoretically plausible were carried out.

Reasons for drinking. Two factors representing reasons for drinking were expected, positively reinforcing reasons for drinking and negatively reinforcing reasons for drinking. The CFAs conducted on the hypothesized factor structure of reasons for drinking revealed that the model did not fit the data for either men and women. For example, the ratio of chi-square to degrees of freedom was 4.05 for men and 5.48 for

women (both above the recommended ratio of 3.0) (Kline, 1998). In addition, all fit indices (NFI, NNFI, CFI, and robust CFI) were below .90.

These results indicated that respecification of the model was necessary. The Lagrange multiplier test for adding parameters was consulted for suggestions on improving the fit of the model. Cross-loadings of the observed variables on the factors were recommended. It was decided that cross-loadings of the observed variables on the factors was not theoretically desirable, as a reason could be loaded on both positively and negatively reinforcing reasons, making the model difficult to interpret. As a result, observed variables that appeared statistically and theoretically problematic were removed from the model, in an attempt to improve its fit. The table of the largest standardized residuals and the squared multiple correlation coefficients were consulted, to identify problematic variables.

A satisfactory model representing reasons for drinking was obtained after an iterative process involving 11 respecifications. Figures 8 and 9 report the variances, correlations, and standardized path coefficients of the final models for reasons for drinking, for men and women. Details of the statistical and conceptual considerations taken at each step in the analysis may be found in Appendix B.

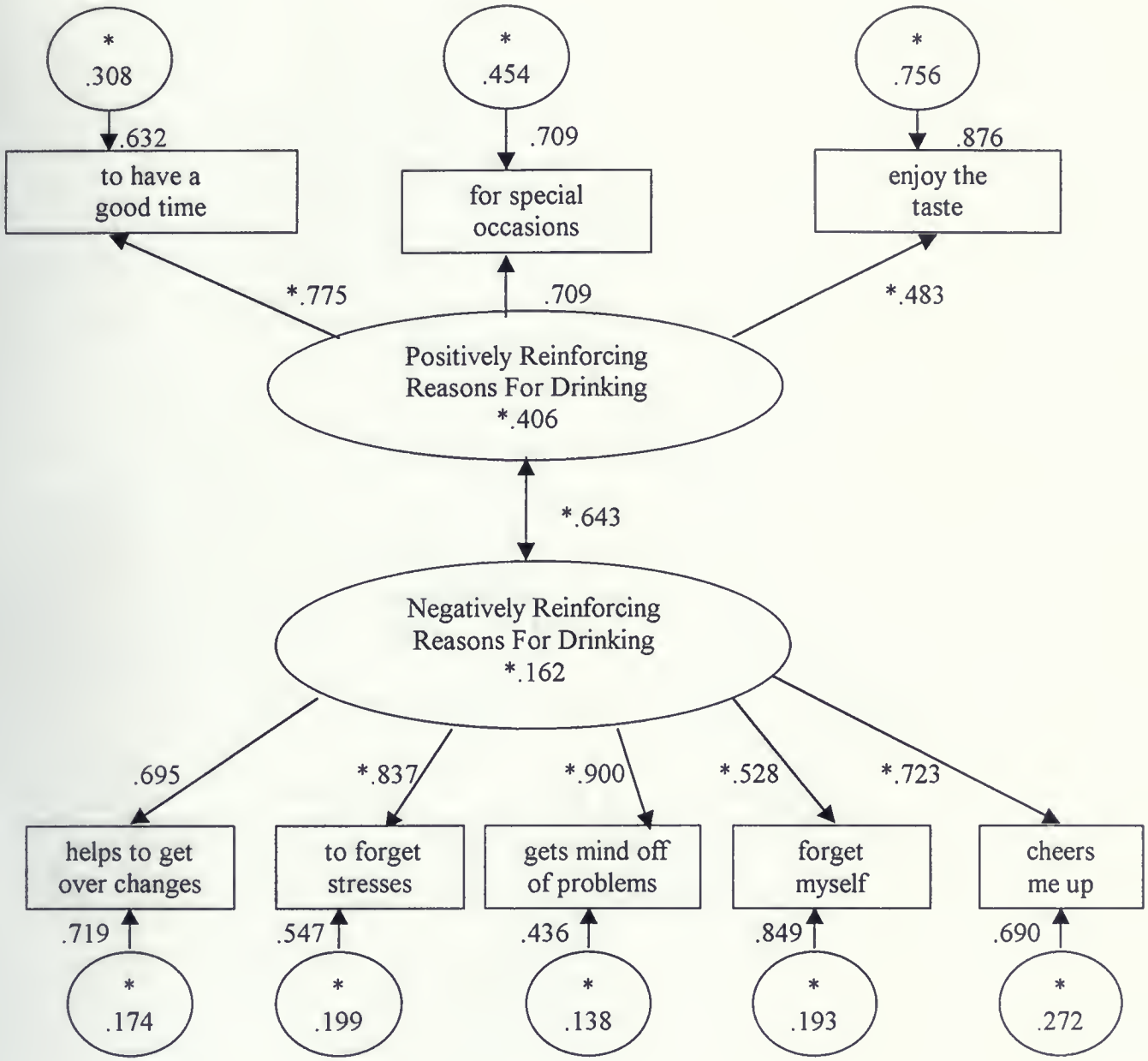

Figure 8. Final measurement model of reasons for drinking – men.

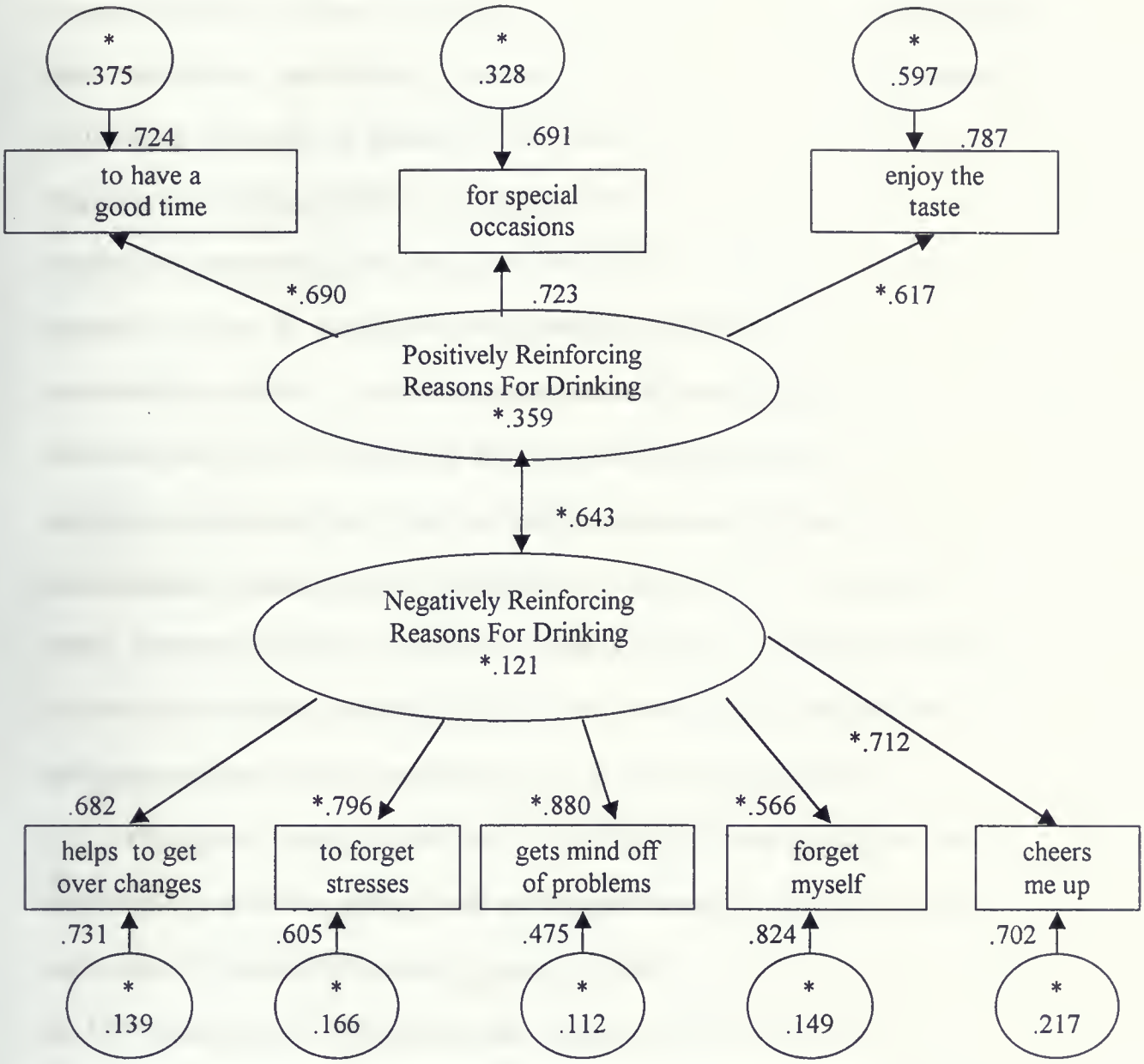

Figure 9. Final measurement model of reasons for drinking – women.

The final measurement model of reasons for drinking was the same for men and women. The following items loaded on the latent variable, Positively Reinforcing Reasons for Drinking: to have a good time, to celebrate special occasions, and enjoy the taste. The following items loaded on the latent variable, Negatively Reinforcing Reasons for Drinking: helps get over changes, to forget stresses, to get mind off problems, to forget I'm not the person I'd like to be, and cheers me up. The ratio of chi-square to degrees of freedom was 2.52 for men and 2.49 for women. Furthermore, all of the fit indices were above .90. Only two of the standardized residuals for men were above the recommended cut-off of .10, and both distributions of the standardized residuals were centered at zero. All paths, variances, and covariances were significant. The robust estimators approximated the statistics calculated using maximum likelihood estimation, indicating that the statistics were not biased due to non-normality of the data (Kline, 1998). The squared multiple correlation coefficients revealed that the models accounted for 50% of the variance in most observed variables. Finally, all of the theoretically ambiguous variables had been removed, making the models clear and concise.

Cross-group equality constraints were imposed on the data, to determine whether the models of reasons for drinking could be considered statistically equivalent for men and women. The ratio of chi-square to degrees of freedom was 2.37, and the NFI, NNFI, and CFI were above .90. These results gave evidence that the models of reasons for drinking were not significantly different for men and women (Kline, 1998). Furthermore, only two of the largest standardized residuals were above .10, and all of the paths, variances, and covariances were significant. The squared multiple correlation coefficients indicated that the latent variables accounted for 50% of the variance in most

observed variables. Finally, the distributions of standardized residuals were centered at zero. Taken together, these indices gave evidence that the final measurement models of reasons for drinking constituted satisfactory explanations of the data, and that these models could be considered statistically equivalent for men and women. The degrees of freedom, chi-square values, ratios, and fit-indices at each step in the analysis are presented in Table B-1 (Appendix B).

Reasons for limiting drinking. The measurement model of reasons for limiting drinking hypothesized the existence of two factors, personal reasons for limiting drinking and social reasons for limiting drinking. The CFAs conducted on the hypothesized model indicated that the model did not provide an adequate fit to the data. For example, the ratio of chi-square to degrees of freedom was 3.59 for men and 5.18 for women, and only some fit indices approached .90. Respecification of the model was therefore necessary.

The Lagrange multiplier test for adding parameters was consulted for suggestions on improving the fit of the model. The ordered univariate test suggested cross-loadings of the observed variables on both latent variables. Cross-loadings, of all observed variables on the latent variables, would make the two-factor model unnecessary. Given that the data were archival, the items necessary to find the two hypothesized factors may not have been present. As a result, a single factor solution of reasons for limiting drinking was tested in further analyses.

After an iterative process, involving 6 respecifications, a final measurement model of reasons for limiting drinking was obtained. An explanation of the statistical and theoretical considerations, taken at each step in the analysis, may be found in

Appendix C. Figures 10 and 11 report the variances and standardized path coefficients of the model, for male and female drinkers.

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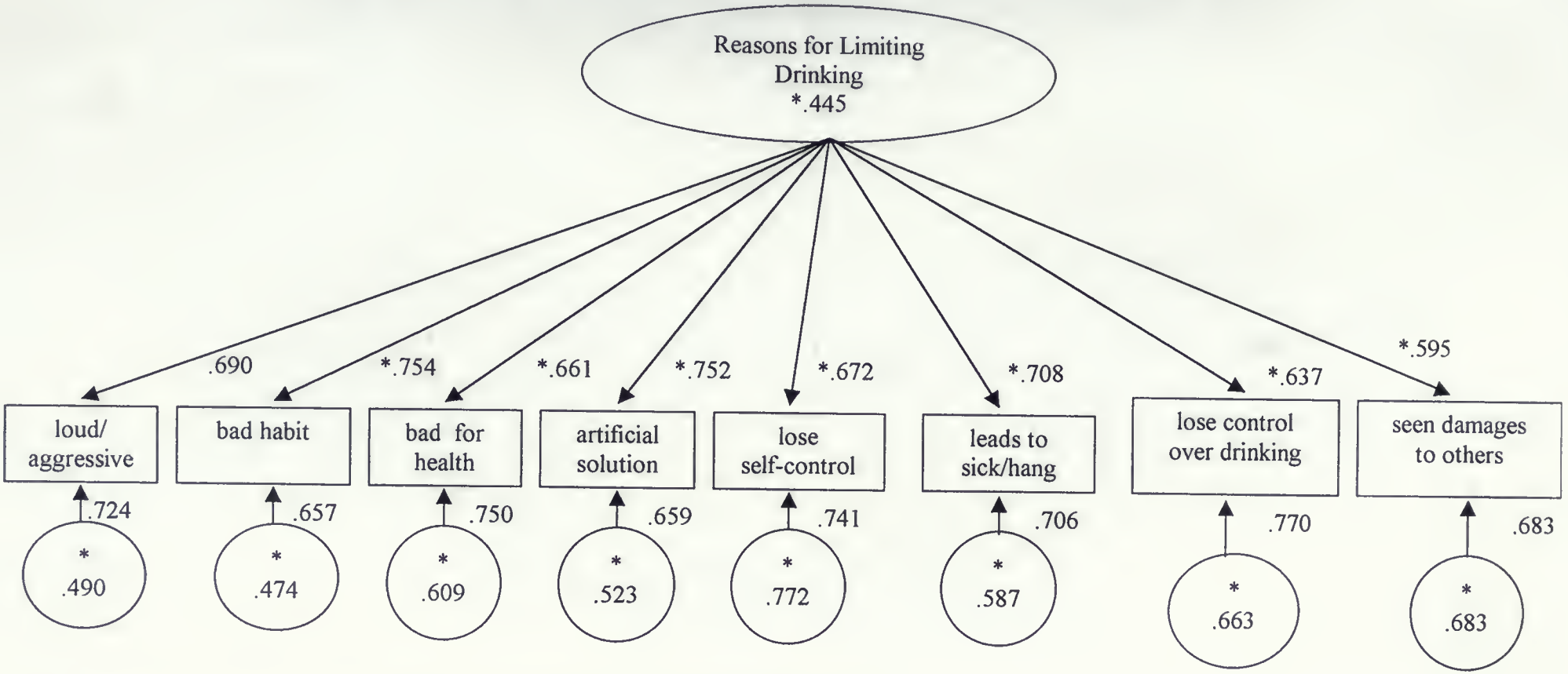

Figure 10. Final measurement model of the reasons for limiting drinking - men.

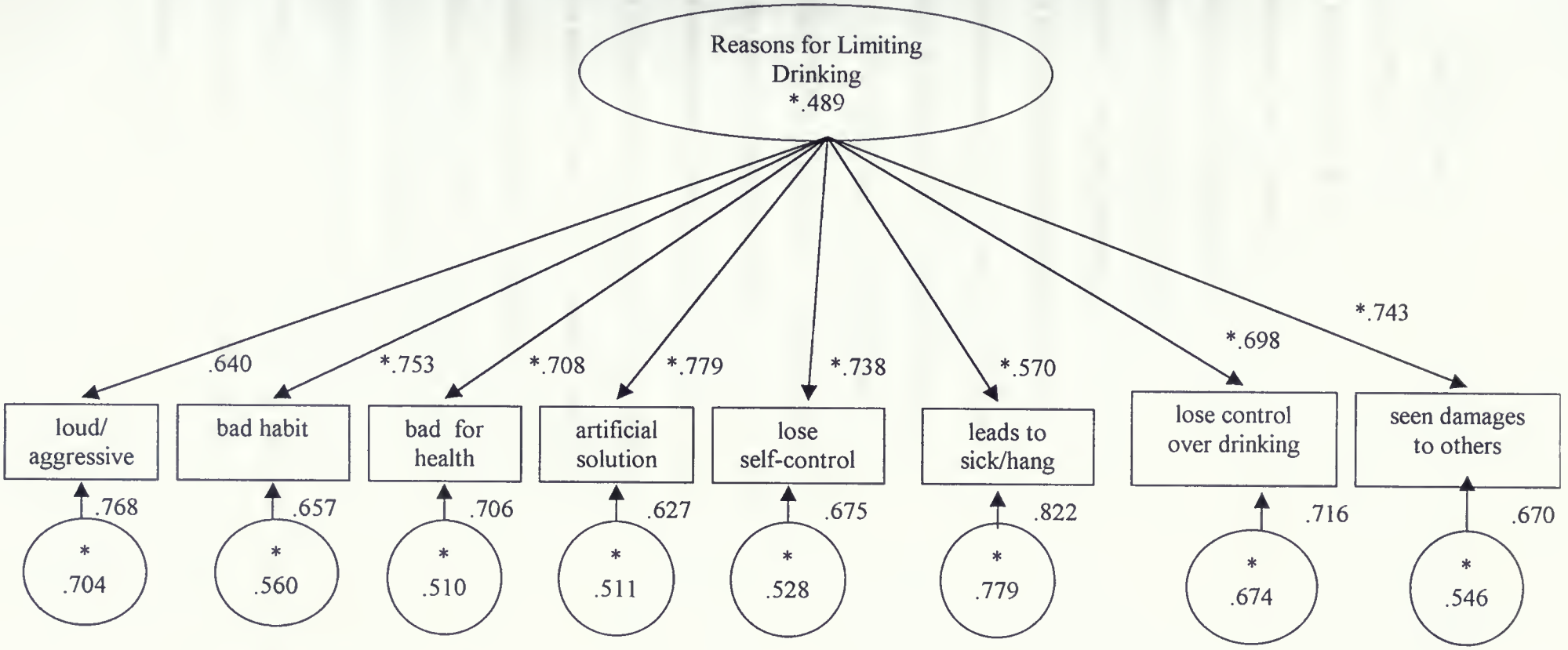

Figure 11. Final measurement model of the reasons for limiting drinking - women.

The final measurement model of reasons for limiting drinking consisted of one factor, composed of the following variables: leads to being loud/aggressive, bad habit, bad for health, artificial way of solving problems, don't want to lose self-control, leads to sick/hangover, don't want to lose control over drinking, and seen damages to others. The ratio of chi-square to degrees of freedom was 3.03 for men and 3.18 for women, and all fit indices were above .90. Furthermore, only one standardized residual was above the cut-off of .10, and both distributions of standardized residuals were centered at zero. All paths and variances were significant, and the robust estimators closely approximated the statistics calculated through maximum likelihood estimation. Finally, the squared multiple correlation coefficients were adequate, with most approaching or exceeding .50.

Cross-group equality constraints were imposed on the final models of reasons for limiting drinking, to determine whether the models differed by sex. The results revealed that the model of reasons for limiting drinking was not significantly different for male and female drinkers. The ratio of chi-square to degrees of freedom was 2.73, indicating that the constrained model provided an adequate fit to the data. Furthermore, all fit indices reached .90, and only two standardized residuals exceeded .10. The distributions of standardized residuals were centered at zero, and all paths and variances were significant. Finally, the squared multiple correlations approached or exceeded .50. These results indicate that a single factor model, of reasons for limiting drinking, adequately explained the variance in the data, and that this model could be considered statistically equivalent for men and women. Table C-1, in Appendix C, reports the degrees of freedom, chi-square values, ratios, and fit indices for each step in the analysis of reasons for limiting drinking.

Problem drinking. Two factors were hypothesized for problem drinking, Consumption and Drinking Problems. The CFA revealed that the model provided a satisfactory representation of the data, for both men and women. Figures 12 and 13 report the variances, correlations, and standardized path coefficients of the model of problem drinking for men and women.

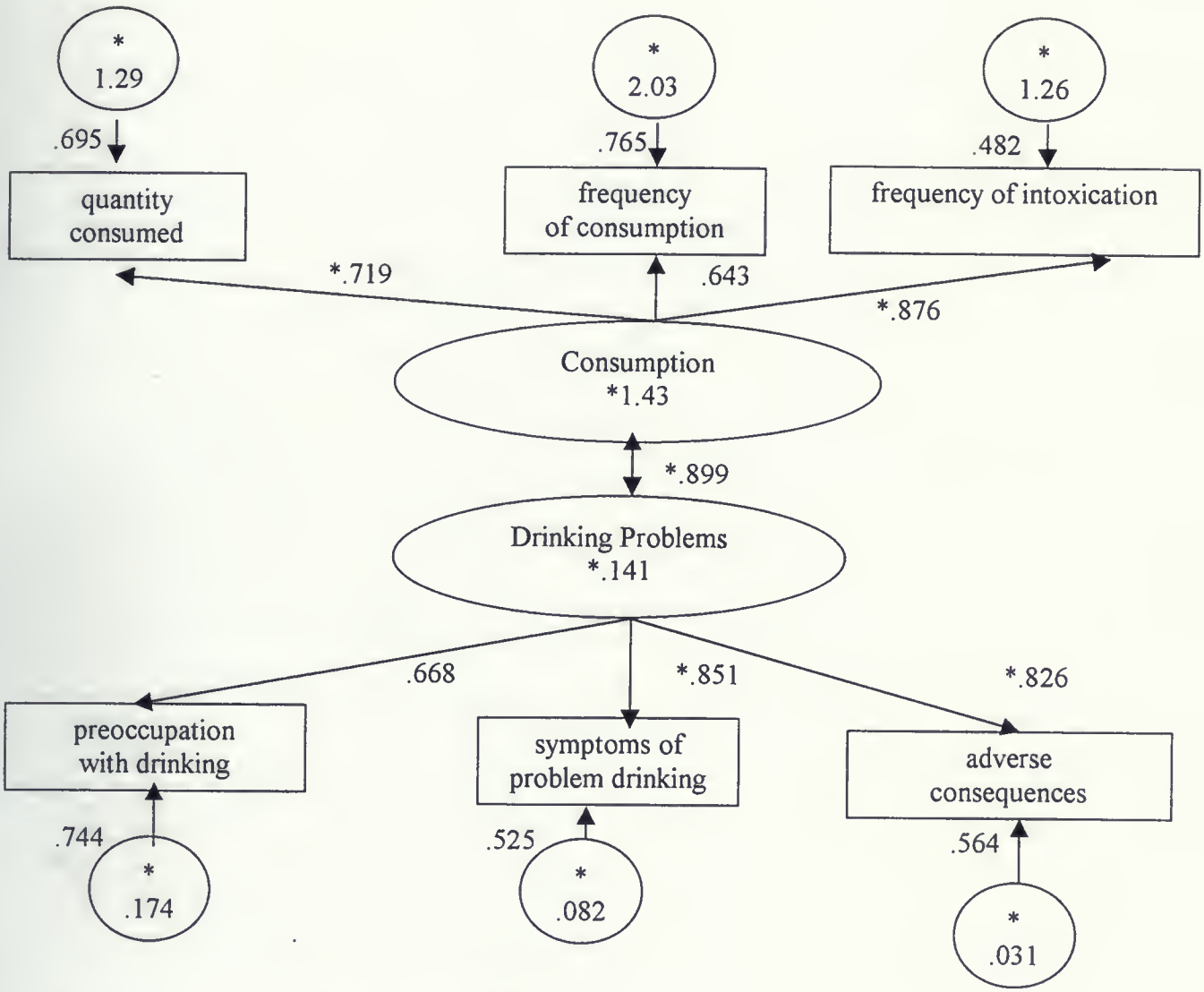

Figure 12. Final measurement model of problem drinking - men.

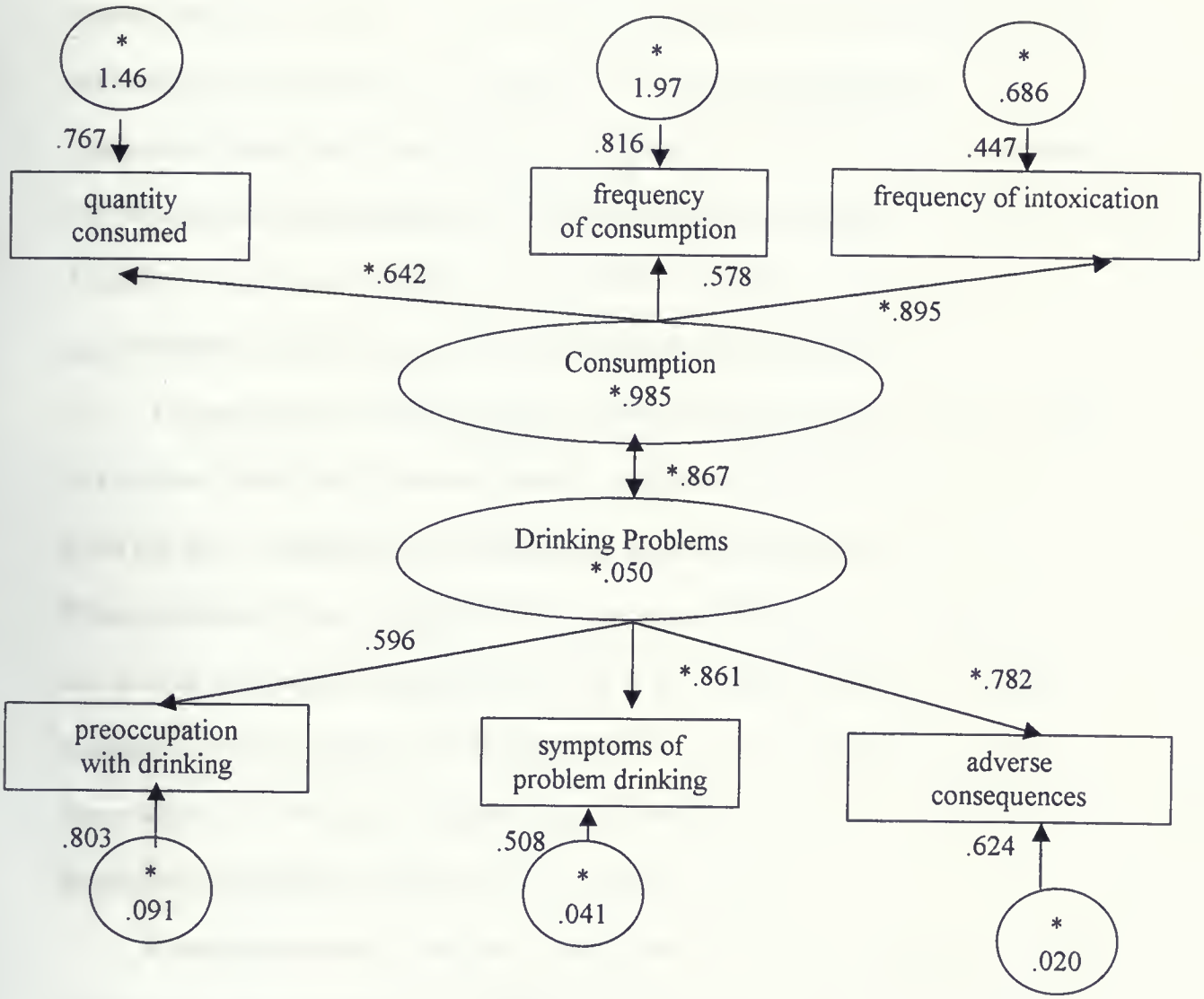

Figure 13. Final measurement model of problem drinking - women.

Quantity of alcohol consumed, frequency of consumption, and frequency of intoxication were loaded on the latent variable, Consumption; and preoccupation with drinking, symptoms of problem drinking, and adverse consequences, loaded on the latent variable, Drinking Problems. The NFI, NNFI, CFI, and robust CFI were above .90. Only one standardized residual was above the value of .10, and the distributions of standardized residuals were centered at zero. The squared multiple correlations indicated that the latent variables accounted for 50% of the variance in most observed variables. All paths, variances, and covariances were significant. Finally, the robust estimators approximated the statistics obtained through maximum likelihood estimation.

The ratio of chi-square to degrees of freedom was above the recommended cut-off of 3.0 (Kline, 1998), for both men and women (4.06 and 6.14 respectively). However, given that the recommended value of the ratio is somewhat arbitrary (Kline, 1998; Wheaton, Muthen, Alwin, & Summers, 1977, as cited in DeCourville & Sadava, 1997), and since all other indices supported the validity of the model, the high ratio of chi-square to degrees of freedom was not considered problematic. In sum, the majority of indices supported the fit of the model to the data, and as a result, the model was considered a satisfactory representation of the structure of problem drinking.

Cross-group equality constraints were imposed on the factor loadings for Problem Drinking, to determine whether the models could be considered statistically equivalent for men and women. No sex differences in the model were found. The ratio of chi-square to degrees of freedom was 4.25 (see explanation of high ratios in the previous paragraph). The NFI, NNFI, and CFI exceeded .90, indicating that the constrained models provided a good fit to the data. Only two standardized residuals were above .10,

and the distributions of standardized residuals were centered at zero. The squared multiple correlation coefficients indicated that the latent variables accounted for at least 50% of the variance, in the majority of variables. Finally, all paths, variances, and covariances were significant. In sum, the two-factor model of problem drinking was an adequate explanation of the data, and this model was not statistically different for men and women. Table D-1, of Appendix D, reports the degrees of freedom, chi-square values, ratios, and fit indices, at each step in the analysis of problem drinking.

The Complete Structural Model

A test of the complete structural model is a test of the relationships among latent variables. These hypothesized relationships were not identical for men and women; and as a result, the complete structural models for men and women were tested separately.

Men. The test of the complete structural model for men revealed that its structure was an adequate explanation of the data. Figure 14 reports the variances, correlations, and standardized path coefficients for the relationships among the latent variables, in the motivational model of problem drinking for men.

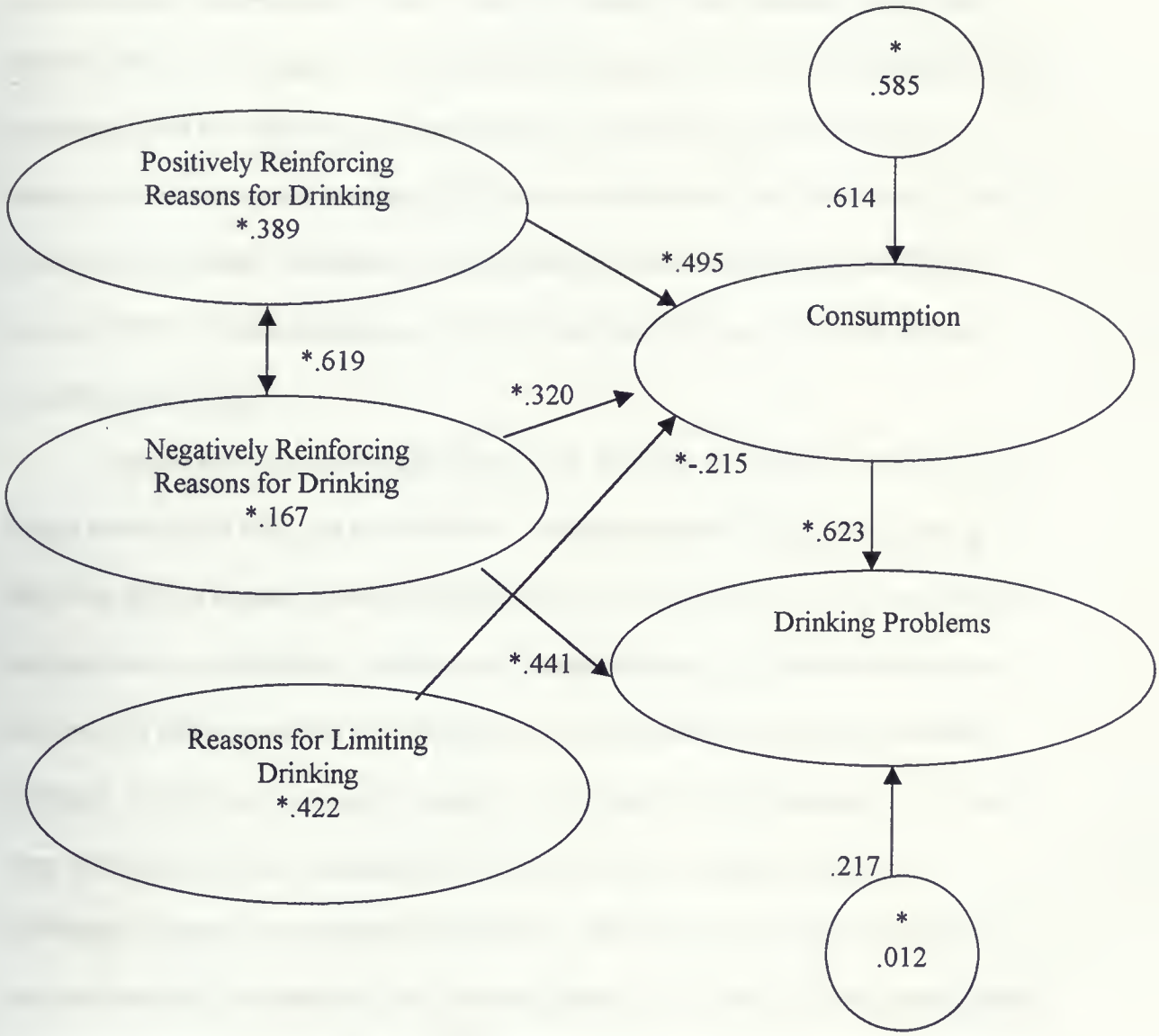

Figure 14. Final path model - men.

The ratio of chi-square to degrees of freedom was 2.06, and all fit indices, except for the NFI (.885), had values above .90. Recall that the NFI indicates the proportion of improvement of the researcher's model relative to the null model (Kline, 1998). Note also that the NNFI provides the same information as the NFI, but also corrects for model complexity, and that the CFI is the same statistic as the NFI, but is less affected by sample size. Furthermore, the robust CFI corrects for non-normality of the data. Given that all other fit indices were above .90, provided the same information as the NFI, and also corrected for characteristics specific to the analysis; the value of the NFI was not considered problematic.

Some of the statistics revealed problems in the fit of the model. For example, the largest standardized residuals were all above the recommended .10 cut-off, indicating that the model did not explain certain correlations very well. The distribution of standardized residuals was not completely centered at zero, again indicating problems with the model. However, all paths, variances and covariances were significant and in the hypothesized direction. In addition, the robust estimators closely approximated the statistics calculated using maximum likelihood estimation. Finally, the squared multiple correlation coefficients showed that the model accounted for 50% of the variance in the majority of observed variables. Furthermore, the squared multiple correlations for Consumption and Drinking Problems were .589 and .927, respectively, indicating that the model provided a good explanation of the variances in these constructs. The results suggest that, although the structural model did not fully explain certain variances in the data, in general, it provided a satisfactory representation of the relationships between reasons and drinking behaviours.

Women. The final motivational model of problem drinking for women had the same structure as the model obtained for men. Figure 15 reports the variances, correlations, and standardized path coefficients of the model for women.

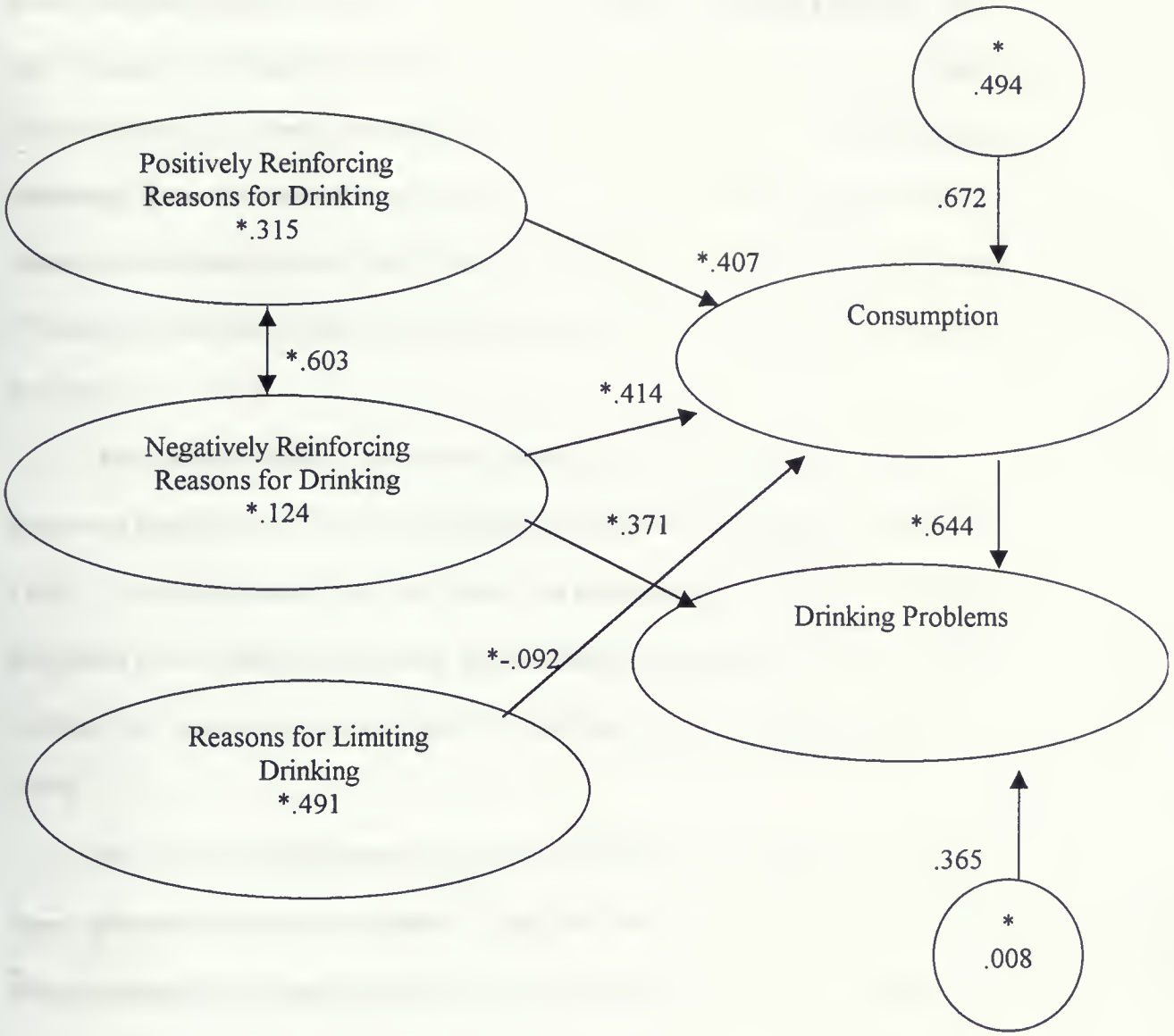

Figure 15. Final path model - women.

The original motivational model of problem drinking for women had an additional path going from Reasons for Limiting Drinking to Drinking Problems. This additional path, not included in the model for men, was significant; however, the Wald test for dropping parameters indicated that this path could be dropped without causing a decrement in the fit of the model to the data. As a result, an analysis of the model was conducted excluding the path from Reasons for Limiting Drinking to Drinking Problems. This less complex model provided a good fit to the data and was used to describe the data for women.

The results of the CFA supported this structure. The ratio of chi-square to degrees of freedom was 2.42, and all fit indices were above .90, except for the NFI (.891). The value of the NFI was not considered problematic, because the NNFI, CFI, and robust CFI had satisfactory values, gave the same information as the NFI, and also corrected for model complexity, sample size, and non-normality of the data (Kline, 1998).

Not all of the findings were supportive of the model. For example, all of the largest standardized residuals exceeded .10, and the distribution of standardized residuals was not completely centered at zero. However, all paths, variances, and covariances were significant and in the hypothesized direction. Furthermore, the robust estimators closely approximated the statistics calculated using maximum likelihood estimation. In addition, the majority of the squared multiple correlation coefficients were above .50. Finally, the squared multiple correlation coefficients for Consumption and Drinking Problems were .561 and .869, respectively, giving support for the relationships among the

latent variables. In sum, although problems with the model were present, in general, the model provided a satisfactory fit to the data.

Multiple group comparisons. Cross-group equality constraints were imposed on the factor loadings and path coefficients of the complete structural models for men and women, to determine if they could be considered statistically equivalent. No sex differences in the models were found: the constrained and unconstrained models provided an equally good explanation of the data. For example, the ratio of chi-square to degrees of freedom was 2.23, and the fit indices (except for NFI=.883) were above .90. Furthermore, all of the paths, variances, and covariances were significant and in the hypothesized direction. The squared multiple correlation coefficients remained adequate, as they approached or exceeded .50. However, problems remained with having large standardized residuals and distributions of standardized residuals that were not centered at zero.

The Lagrange multiplier test was consulted for suggestions on improving the fit of the model. The test suggested that the constraint for the path coefficient from Consumption to Drinking Problems be released. Releasing this constraint was theoretically plausible, because it had been predicted that men would have a stronger relationship between Consumption and Drinking Problems than women. In fact, when the constraint was released, the path coefficient between Consumption and Drinking Problems was larger for men than for women; however, this difference was not significant (t (740) = 1.65, p>. 05).

The Lagrange multiplier test for adding parameters was consulted in this new output. The test suggested releasing the constraint for the loading of taste on Positively

Reinforcing Reasons for Drinking. This respecification was not carried out, as it was not theoretically desirable. The next suggestion of the Lagrange multiplier test was to drop the constraint for the path coefficient from Reasons for Limiting Drinking to Consumption. Since Reasons for Limiting Drinking had been hypothesized to have a stronger impact on level of Consumption for women, dropping this constraint made theoretical sense. The constraint was released and the model was re-analyzed. The results did not support the hypothesis, as differences in the path coefficients were not significant (t (740) = -1.80, $p > .05$).

The Lagrange multiplier test was again consulted for suggestions on improving the fit of the model to the data. Releasing the constraint of the loading of taste on Positively Reinforcing Reasons for Drinking was suggested. As previously discussed, releasing this constraint was not theoretically desirable. Other constraints did not significantly affect the fit of the model.

When the constraints were released, differences in the values of the path coefficients for men and women were not significant. Given the nonsignificant differences in the path coefficients and the fact that releasing the constraints did not provide much improvement in the fit of the model, the final structural models of men and women were considered equivalent and no constraints were released. These results provide evidence that the structure of the relationships between reasons and drinking is the same for men and women. Table E-1, in Appendix E, reports the degrees of freedom, chi-square values, ratios, and fit indices for each step in the analysis of the complete structural model.

Discussion

The results of the analyses of the complete structural models for men and women, revealed support for the men's, but not for the women's model. In fact, no support was obtained for any of the hypothesized gender differences, and in the end, the motivational model for women was the same as the hypothesized model for men. Finally, a large, random, community sample of young men and women from the Niagara region was used in the analyses. Consequently, these results can be generalized to other young men and women from similar communities in Canada.

Evidence supporting the model of problem drinking was obtained and is of particular importance. A correlation exists between consumption and drinking problems, such that, as consumption increases, drinking problems also increase (West et al., 1990). Consequently, researchers have traditionally operationalized problem drinking as a unitary construct, considering consumption and drinking problems as equivalent or interchangeable (Sadava, 1985). However, there is evidence of drinking problems that are not determined entirely by consumption (Sadava, 1985; Mckay et al., 1992). For example, some people equal in level of consumption, have different frequencies of drinking problems (Sadava, 1985; Mckay et al., 1992). Consequently, these models fail to account for drinking problems that are independent of the level of alcohol consumed. The present model accounted for drinking problems, independent of level of consumption, by conceptualizing problem drinking as being composed of two constructs, Consumption and Drinking Problems, with a positive path from Consumption to Drinking Problems. Consequently, this model allows for two paths to Drinking Problems: an indirect path through Consumption, and a direct path to Drinking

Problems, which is independent of Consumption. In sum, support for this model is an important contribution to the literature, because it allows for differences in drinking problem severity, with similar levels of consumption.

Analysis of the structural model revealed independent influences of Positively and Negatively Reinforcing Reasons for Drinking on Drinking Problems, indirectly through level of Consumption. Only Negatively Reinforcing Reasons for Drinking had a direct influence on Drinking Problems, independent of Consumption. This suggests that something specific to Negatively Reinforcing Reasons for Drinking, independent of its effect on Consumption, causes an increase in Drinking Problems. Stress has also been linked to an increase in drinking problems, independent of level of consumption (Sadava & DeCourville, 1997; Sadava & Pak, 1992). Indeed, because Negatively Reinforcing Reasons for Drinking involve drinking to reduce negative moods and/or feelings, it may represent a way of coping with stress. Consequently, drinking alcohol, as a means of coping with stress, may account for the independent influence of Negatively Reinforcing Reasons on Drinking Problems.

The results of the analysis of the structural model also revealed the significant and independent influence of Reasons for Limiting Drinking on Consumption. This demonstrates that, in addition to reasons for drinking, reasons for limiting drinking and the negative consequences of drinking are important motivating factors influencing consumption. Consequently, to best understand the motivations influencing the consumption of alcohol, reasons for limiting drinking should be studied as independent contributors. This is an important finding, since the literature studying the effects of

reasons for limiting drinking on consumption is scarce (Greenfield et al., 1989; Slicker, 1997; Temple, 1986).

The multiple group comparisons, conducted using cross-group equality constraints, provided no evidence supporting the hypothesized gender differences. These results are surprising, given the evidence for gender differences in consumption, drinking problems, and the reasons motivating consumption (Ferrence, 1984; Hill, 1984; Dunne et al., 1993). Nevertheless, they may be a result of the convergence of drinking patterns for men and women (Thompson & Wilsnack, 1984; Dunne 1990; as cited in Dunne et al., 1993). For example, with increasing awareness of women's issues and alcoholism, the stigma associated with heavy drinking in women may be dissipating, whereas heavy drinking in men may no longer be considered a sign of masculinity. In short, the norms and sanctions for drunkenness in men and women may have converged to such an extent that drinking in community samples is similar for men and women. In addition, it is possible that the hypothesized gender differences only exist in samples of problem drinkers. Recall that, given the cultural expectations put on women in terms of the consumption of alcohol (Fillmore, 1984), most women will choose to abstain or to limit their drinking (Corrigan, 1985). Furthermore, it has been suggested that only those suffering from severe psychological distress will choose to drink at levels where drinking problems are likely to occur (Nadeau & Harvey, 1997). In hindsight, it is reasonable to assume that the proposed relationships, for the motivational model of problem drinking for women, would only be found in women identified as problem drinkers.

Given that the data were archival, there was little choice for the items used in the measurement models. As a result, confirmatory factor analyses were conducted in an

exploratory manner for the models of reasons for drinking and reasons for limiting drinking. The analyses involved many iterations, and consequently, the results are of questionable validity.

The numerous iterations involved in the analysis of reasons for drinking revealed the probability of other factors of reasons for drinking such as physical reasons, psychological reasons, sexual reasons, and self-confidence reasons. Even so, the literature on reasons for drinking suggests that the factors, Positively and Negatively Reinforcing Reasons for Drinking, are representative of most reasons for drinking (Cox & Klinger, 1988; Stewart et al., 1996; Carey & Correia, 1995; Cronin, 1997). Indeed, this taxonomy is the most appropriate one for the present analyses. Furthermore, the complete structural model indicates that Positively and Negatively Reinforcing Reasons for Drinking contribute independent variance to Consumption and Drinking Problems, thus giving further evidence supporting the validity of this taxonomy.

In the analysis of reasons for drinking, the original four hypothesized factors, personal/positive, personal/negative, social/positive, and social/negative seemed to emerge. For example, social/negative reasons for drinking were dropped from the latent variable, Negatively Reinforcing Reasons for Drinking, as they did not fit well with the personal/negative reasons for drinking. Furthermore, although both social/positive and personal/positive reasons for drinking loaded on the same latent variable, Positively Reinforcing Reasons for Drinking, the output revealed that the personal/positive reason for drinking did not fit well with the other social/positive reasons for drinking (note: these two categories were combined, because so few items in the questionnaire expressed Positively Reinforcing Reasons for Drinking). This suggests that the four hypothesized

reasons for drinking exist and would be found with a larger and more variable list of reasons.

The use of archival data resulted in the abandonment of a two-factor model of reasons for limiting drinking. Although the two factors were not obtained, the original model is still thought to be theoretically and statistically valid. It may be that this model was unworkable, because so few items expressing social reasons for limiting drinking were present in the questionnaire. In fact, according to the literature (Greenfield et al., 1989; Slicker, 1997; Temple, 1986), the hypothesized two-factor structure, including personal and social reasons, is the most coherent and representative factor-structure of reasons for limiting drinking. However, for the present analyses, one factor of reasons for limiting drinking was sufficient.

This study has implications for intervention with problem drinkers. As discussed in the introduction, problem drinkers differ from alcoholics in that they are not physically dependent upon alcohol (Doweiko, 1999). However, they still exhibit symptoms of alcohol abuse, which are potentially harmful to themselves and others. As a result, intervention at this stage may be useful in alleviating these symptoms, and in preventing a downward spiral, possibly leading to alcoholism.

The results demonstrate the importance of the influences of both reasons for drinking and reasons for limiting drinking on problem drinking. As a result, when treating problem drinkers, it would be beneficial to address both reasons for and against drinking. For example, reasons for limiting drinking could be made more salient, with the intention of decreasing level of consumption. In addition, since Negatively Reinforcing Reasons for Drinking may indicate drinking as a means of coping with

stress, when treating problem drinkers, alternative ways of coping with stress should be addressed.

Future research could extend these findings by exploring the direction of causality between reasons and drinking behaviors. As mentioned in the introduction, the direction of causality from reasons to consumption and drinking problems may be reversed or may even represent a reciprocal relationship. Indeed, longitudinal data could be used to study causality, by investigating the relationships between reasons and drinking behaviors, over time.

Additionally, it is hoped that this study will encourage more research on the influence of reasons for limiting drinking on problem drinking. That is, in addition to the positive consequences of drinking, an awareness of the negative consequences of drinking represent interesting influences on the motivation to consume alcohol.

Finally, it is desirable that the complete structural model be tested using a sample identified as problem drinkers. As previously discussed, it is possible that the hypothesized gender differences will be supported in a sample of problem drinkers. Furthermore, qualitative research, in the form of intensive interviews, may help to achieve a better understanding of gender differences in the experience of drinking and problem drinking. This research could be used to confirm previous hypotheses, as well as to direct future quantitative research in this area.

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Footnotes

[1]The number of estimable parameters is equal to the number of parameters that are free to vary (Byrne, 1994). This includes the variances and covariances of the exogeneous variables (exogeneous latent factors, measurement errors, disturbances), the factor loadings, and the path coefficients.

[2]The total number of parameters in a model is the product of the number of observed variables (v) and the number of observed variables plus 1, divided by 2 (Byrne, 1994) [v x (v + 1) / 2].

[3]Degrees of freedom are calculated by subtracting the number of parameters to be estimated from the total number of parameters.

Appendix A

Appendix A lists the questions used in all single-item and composite variables.

Reasons

The following items were used to assess reasons for drinking and reasons for limiting drinking.

Reasons for Drinking

People may drink for many different reasons. The following is a list of the various reasons that people have given for drinking. Please indicate how important each reason is for you in your own use of alcoholic beverages.

Response scale: 1 = not at all important; 2 = not too important; 3 = pretty important; 4 = very important;

1. To have a good time or celebrate, to party
2. Because I'm expected to drink
3. Usually have wine with meals
4. Helps me get over changes in my life
5. Eases aches and pains
6. Makes me feel more satisfied with myself
7. Help me forget stresses at work or school
8. Helps me get my mind off my problems for a while
9. Helps me forget I'm not the person I'd like to be
10. I worry less about what others will think of me

11. Helps me get to sleep

12. Helps me deal with boredom at school or at work

13. Makes me feel sexier, more romantic

14. A good way to mark special occasions

15. I enjoy the taste

16. Makes it easier to talk to people

17. Makes me feel more powerful

18. Cheers me up when I'm down

Reasons for Limiting Drinking

The following list includes some of the reasons that people have given for not drinking. Please indicate how important each reason is for you when you decide NOT to drink.

Response scale: 1 = not at all important; 2 = not too important; 3 = pretty important; 4 = very important

1. It just tastes bad to me

2. Because it leads to being loud and aggressive

3. It's against my religion

4. The people I hang around with are against it

5. Because it gets to be a bad habit

6. It's not good for my health

7. It's just an artificial way of solving problems

8. It can lead to getting in trouble with the law

9. I don't want to lose my self-control
10. It often makes me sick to my stomach or leaves me with a bad hangover
11. I'm afraid of losing control of my drinking
12. I've seen the damage that drinking can do to people
13. I am or may be pregnant
14. It sets a good example for the kids
15. I'm a recovering alcoholic

Consumption

This section reports the items used to assess consumption.

Quantity

On average, when you are drinking, about how much do you drink on one occasion?

Response scale: 0 = nothing; 1 = no more than a sip or a taste; 2 = less than a drink; 3 = one drink (a draft of beer, half a glass of wine); 4 = 1 1/2 drinks; 5 = 2 drinks; 6 = 3 drinks; 7 = 4 or 5 drinks; 8 = 6 or 7 drinks; 9 = more than 7 drinks;

Frequency

How often do you go drinking or have a drink?

Response scale: 0 = never; 1 = less than once a month; 2 = about once a month; 3 = about twice a month (once every two weeks); 4 = once a week; 5 = twice a week; 6 = 3 or 4 times a week; 7 = 5 or 6 times a week; 8 = about once a day; 9 = more than once a day;

Frequency of Intoxication

Frequency of intoxication is a composite variable, made up of the average of the following three questions.

In the past year, how often have you drunk enough alcoholic beverages to:

Response scale: 1 = not at all; 2 = 1-2 times; 3 = 3-4 times; 4 = 5-6 times; 5 = 7-8 times; 6 = 9-10 times; 7 = 11-12 times; 8 = more than 12 times;

1 - feel pretty high

2 - feel unsteady on your feet

3 - feel that you are drunk

Drinking Problems

This section describes the items used to assess drinking problems.

Preoccupation with Drinking

Preoccupation with drinking is a composite variable, calculated by averaging each participant's score on the following five items.

Please indicate how similar your behaviour is to that of each of the following:

Response scale: 1 = not at all like me; 2 = a little bit like me; 3 = somewhat like me; 4 = quite a bit like me;

1. Leslie often finds himself talking about alcohol.
2. Carol often finds herself thinking about alcohol.
3. Andy tries to keep a supply of alcoholic beverages on hand.
4. Tom prefers parties where he knows he can have a few drinks.
5. When deciding where to go for dinner, Sue always chooses a place that serves alcoholic beverages.

Symptoms of Problem Drinking

'Symptoms of problem drinking' is a composite variable, made up of the average of the following five items.

1. Have you spent more than a day or a whole weekend drinking in the past year?

Response scale: 1 = never; 2 = once; 3 = twice; 4 = more than twice;

2. How often have you tossed down several drinks fast to get a quick effect?

Response scale: 1 = never; 2 = once a month; 3 = twice a month; 4 = about once a week; 5 = most days;

3. Do you feel able to stop drinking whenever you want to, once you start?

Response scale: 1 = always (or, I never drink); 2 = usually I can stop; 3 = sometimes I can stop, sometimes I have trouble; 4 = often I have trouble stopping;

4. Do you find that you drink moderately in front of others and consume a lot when you are alone?

Response scale: 1 = never; 2 = rarely; 3 = often; 4 = always;

5. Do you ever find that you're feeling guilty or ashamed after you've been drinking?

Response scale: 1 = never; 2 = rarely; 3 = often; 4 = always;

Adverse Consequences of Drinking

Adverse consequences is a composite variable, calculated by averaging each participant's score on 35 adverse consequences of drinking.

Different things happen to different people when they drink alcohol. Some of these things are listed below. Indicate how often each of the following has occurred in the past year.

Response scale: 1 = never; 2 = 1-2 times; 3 = 3-4 times; 4 = more than 5 times;

1. Weren't able to concentrate on work or studies
2. Got into fights
3. Didn't remember things you said or did after a certain point in time
4. Missed out on other things because you spent too much money on alcohol
5. Went to work or classes high or drunk
6. Caused shame or embarrassment to someone
7. Neglected your responsibilities
8. Friends or relatives avoided you
9. Felt paranoid or "uptight"
10. Felt that you needed to drink more than you used to in order to get the same effect
11. Felt sick because you stopped or cut down on your drinking
12. Noticed a change in your personality
13. Had the shakes, fits, seizures, DT's, or you saw or heard things that are not really there
14. Lost a job
15. Got hurt or had an accident
16. Missed a day (or part of a day) of school or work
17. Passed out or fainted suddenly

18. Suddenly found yourself in a place that you couldn't remember getting to
19. Been in trouble with the police for something you did while you were drinking
20. Felt you were going crazy
21. Had a bad time
22. Damaged property on purpose
23. Stole something
24. Hurt someone badly
25. Lost chance of getting ahead on a job
26. Got into trouble with your family
27. Unexpectedly became fearful or anxious for no apparent reason
28. Charged with impaired driving
29. Felt depressed and down on yourself
30. Experienced sexual problems
31. Loss of memory
32. Trouble thinking clearly
33. Felt irritable, jittery
34. Felt apathetic, not motivated to do anything
35. Had a bad hangover

created. Finally, the model of reasons for drinking, with 'eases aches and pain' removed, provided a good fit to the data.

Appendix B

Appendix B describes the process used to derive the final model of reasons for drinking from the hypothesized model. The statistical and theoretical rationale supporting each respecification is described. Furthermore, chi-square values, degrees of freedom, ratios, and fit indices, for each step in the analysis, are presented in Table C-1 of this Appendix.

The CFA of reasons for drinking revealed that the hypothesized model did not fit the data adequately. In an attempt to improve the model's fit, variables that were deemed to be statistically and theoretically problematic, were removed.

The computer output was consulted, and the variable, 'expected to' was found to be both statistically and theoretically problematic. For example, it was listed in the table of the largest standardized residuals and had a low squared multiple correlation coefficient (.167 for men and .039 for women). Furthermore, this variable had social implications, making it theoretically different from the majority of the other negatively reinforcing reasons for drinking, which were associated with personal matters. In fact, the literature reports a strong correlation between negatively reinforcing reasons for drinking and personal reasons for drinking (Graham et al., 1996; Jung, 1977; Hermos et al., 1988). Furthermore, personal/negative reasons for drinking are more often studied in the literature (Graham et al., 1996; Jung, 1977; Hermos et al., 1988). Since personal/negative reasons appeared to be of more theoretical importance than social/negative reasons (Graham et al., 1996; Jung, 1977; Hermos et al., 1988), it was decided that these reasons would be used to identify negatively reinforcing reasons for drinking.

The variable, 'expected to', was removed from the latent variable, negatively reinforcing reasons for drinking, and a CFA of reasons for drinking was conducted. Again, the model did not fit the data adequately, and the computer output was consulted for clues that would help to understand the lack of fit. The observed variable, 'have wine with meals', appeared several times in the table of the largest standardized residuals and revealed a low squared multiple correlation coefficient (.053 for men and .166 for women). Furthermore, 'have wine with meals' was deemed to be theoretically problematic, as it may not represent a positively reinforcing reason for drinking, but may indicate a custom or a habit. Given its statistical weakness and theoretical ambiguity, this variable was removed from the model.

The results of the CFA revealed that respecification was still required to achieve a good fit. The table of the largest standardized residuals and the squared multiple correlation coefficients identified the variable, 'to feel powerful', to be statistically problematic. Furthermore, having a drink to feel more powerful was theoretically ambiguous. For example, it may have been perceived as having a drink to feel even more powerful (positively reinforcing) or having a drink to eliminate feelings of powerlessness (negatively reinforcing). Given that 'to feel powerful' was statistically problematic and theoretically ambiguous, it was removed from the model.

The CFA revealed slight improvements in the model's fit; however, further respecification of the model was necessary, and the output was consulted. The results indicated that the variance of the observed variable, 'talking easier', was not adequately explained by the model. Furthermore, 'talking easier' was a social/negative reason for drinking, as it implies drinking to ease socializing. Since it had been decided on

empirical grounds that this measurement model would only use personal/negative reasons to represent negatively reinforcing reasons for drinking, 'talking easier' was removed from the model.

The output of the CFA revealed that the model was still an inadequate explanation of the variance in the data. The tables of the largest standardized residuals and the squared multiple correlation coefficients identified 'makes me feel sexier', as statistically problematic. In addition, drinking to feel sexier, was deemed to be a theoretically ambiguous reason for drinking. For example, it could be interpreted as drinking to enhance an already romantic feeling or drinking to reduce feelings of insecurity in a romantic situation. As a result, 'makes me feel sexier' was removed from the model.

The output from the CFA indicated that further respecification of the model was necessary. The output revealed that the variable, 'to sleep', was statistically problematic. Furthermore, this reason had physical implications, which may have made it intrinsically different from the other psychological reasons for drinking. As a result, 'to sleep' was removed from the model of reasons for drinking.

The results of the CFA showed an almost adequate fit of the model to the data. Again, the table of the largest standardized residuals and the squared multiple correlation coefficients were consulted. They identified 'to relieve boredom', as a variable that was not adequately explained by the model. Theoretically, this reason for drinking was ambiguous. For example, it could be interpreted as drinking to remove an unpleasant state or drinking to have a good time. Consequently, the observed variable, 'to relieve boredom', was removed from the model.

After 'to relieve boredom' was removed from the measurement model, the fit was still not satisfactory. The output was consulted and revealed that 'to be more satisfied with myself' was statistically problematic. Furthermore, the meaning of 'being more satisfied with myself' is ambiguous. For example, it could be interpreted as drinking to feel even more satisfied with myself, or because I am unsatisfied with myself. As a result, this variable was removed from the model.

The CFA showed an improvement in the fit of the model. Again, the output was consulted and the reason, 'to worry less about what others will think of me', was identified as statistically problematic. Furthermore, drinking 'to worry less about what others will think of me' implied drinking to reduce the stress experienced in a social situation, making it a social/negative reason for drinking. Since it was decided that social/negative reasons would not be included in the model, 'to worry less about what others will think of me' was removed.

The output from this CFA gave statistical support for the two-factor model of reasons for drinking. The ratio of chi-square to degrees of freedom was 2.42 for men and 2.61 for women, and all of the fit indices were above .90. To ensure that the model was theoretically sound, as well as statistically adequate, the model was examined for theoretical inconsistencies. The item, 'eases aches and pain', was identified as theoretically problematic. Since drinking 'to sleep' had been excluded because of its association with the removal of physical discomfort, as opposed to psychological discomfort, 'eases aches and pain' was removed for the same reason. Given that all the remaining reasons could reasonably be associated with the relief of psychological discomfort, a more coherent factor of the negatively reinforcing reasons for drinking was

Table B-1. Chi-square Values and Fit Indices for Each Step in the Analysis of Reasons for Drinking

Step	Sex	df	χ^2	Ratio	NFI	NNFI	CFI	Robust CFI
1	M	134	543.104	3.99	0.783	0.801	0.825	0.813
	F	134	733.706	5.48	0.759	0.763	0.792	0.730
2	M	118	490.090	4.15	0.795	0.810	0.835	0.824
	F	118	708.723	6.01	0.764	0.763	0.794	0.723
3	M	103	442.471	4.30	0.810	0.821	0.846	0.836
	F	103	640.322	6.22	0.777	0.773	0.805	0.730
4	M	89	332.124	3.73	0.844	0.858	0.880	0.871
	F	89	500.955	5.63	0.807	0.805	0.835	0.771
5	M	76	253.367	3.33	0.870	0.886	0.905	0.900
	F	76	369.105	4.86	0.841	0.843	0.869	0.828
6	M	64	213.714	3.34	0.885	0.897	0.916	0.909
	F	64	303.850	3.75	0.859	0.859	0.884	0.850
7	M	53	181.089	3.42	0.895	0.904	0.923	0.915
	F	53	271.966	5.13	0.864	0.859	0.887	0.846
8	M	43	162.042	3.77	0.896	0.899	0.921	0.912
	F	43	231.579	5.39	0.877	0.868	0.897	0.860
9	M	34	131.255	3.86	0.902	0.900	0.925	0.919
	F	34	168.519	4.96	0.898	0.889	0.916	0.894
10	M	26	62.933	2.42	0.946	0.954	0.967	0.967
	F	26	67.855	2.61	0.953	0.959	0.970	0.971
11	M	19	47.899	2.52	0.954	0.958	0.972	0.969
	F	19	47.277	2.49	0.963	0.967	0.977	0.978
12	M=F	44	104.302	2.37	0.955	0.966	0.973	

Note: M=F symbolizes the imposition of cross-group equality constraints across male and female drinkers. "Ratio" is the ratio of chi-squared to degrees of freedom.

Appendix C

Appendix C describes the modifications made to the hypothesized measurement model of reasons for limiting drinking. The statistical and theoretical considerations made at each step in the analysis are explained. Chi-square values, degrees of freedom, ratios, and fit indices, for each step in the analysis, are presented in Table C-1 of this Appendix.

The results of the CFA of reasons for limiting drinking revealed that the hypothesized model did not provide an adequate fit to the data. The Lagrange multiplier test suggested cross-loadings of the observed variables on both factors. As a result, a single factor model of reasons for limiting drinking was tested.

The next CFA loaded all twelve reasons for limiting drinking onto one factor. The output revealed that the model was still an inadequate explanation of the data. As with the model of reasons for drinking, the table of the largest standardized residuals and the squared multiple correlation coefficients were consulted to identify and remove variables that were statistically and theoretically problematic. 'Tastes bad' was identified as problematic, because it had a low squared multiple correlation coefficient (.110 for men and .132 for women). Furthermore, 'tastes bad' was theoretically different from the other reasons for limiting drinking, because negative consequences from drinking were not implicit in its meaning. Consequently, 'tastes bad' was removed from the model.

With 'tastes bad' removed from the model, the fit improved slightly; however, further respecification was required. The output showed the variable, 'it's against my religion', to be statistically problematic, as it had a low squared multiple correlation coeffiecient (.165 for men and .245 for women). Religion was a social reason for

limiting drinking, making it different from most other reasons for limiting drinking, which were personal in nature. Due to its statistical weakeness and theoretical distinctiveness, 'it's against my religion' was removed from the model.

The results of the next CFA revealed that the model provided an adequate fit to the data. However, the squared multiple correlation coefficient for the variable, 'friends are against it', was low (.254 for men and .265 for women). Furthermore, this was a social reason for limiting drinking, which was problematic, because the majority of reasons for limiting drinking were personal. As a result, 'friends are against it' was removed from the model and another CFA was conducted. The results revealed a satisfactory fit of the model to the data.

All statistically problematic reasons for limiting drinking had been removed from the model, and the overall model provided a good fit to the data. Nevertheless, the possibility of theoretically problematic variables was investigated. It was noticed that all variables representing the factor, reasons for limiting drinking were personal, except for 'against the law'. As previously noted, social reasons for limiting drinking were viewed as theoretically different from personal reasons for limiting drinking. Since 'against the law' was the only social reason for limiting drinking remaining, it was removed from the model. The analysis of the new model, revealed a satisfactory fit of the model to the data, for both men and women.

Table C-1. Chi-square Values and Fit Indices for Each Step in the Analysis of Reasons for Limiting Drinking

Step	Sex	df	χ^2	Ratio	NFI	NNFI	CFI	Robust CFI
1	M	53	190.528	3.59	0.874	0.881	0.905	0.913
	F	53	274.821	5.19	0.881	0.877	0.901	0.920
2	M	54	192.369	3.56	0.872	0.883	0.904	0.912
	F	54	708.723	6.01	0.764	0.763	0.794	0.723
3	M	44	167.683	3.81	0.884	0.889	0.911	0.919
	F	44	244.006	5.55	0.890	0.884	0.907	0.926
4	M	35	99.836	2.85	0.925	0.935	0.950	0.961
	F	35	112.413	3.21	0.943	0.948	0.960	0.972
6	M	27	87.591	3.24	0.929	0.933	0.950	0.965
	F	27	73.852	2.74	0.959	0.965	0.974	0.985
7	M	20	60.522	3.03	0.940	0.942	0.959	0.970
	F	20	63.541	3.18	0.958	0.959	0.971	0.982
8	M=F	47	128.134	2.73	0.950	0.961	0.968	

Note: M=F symbolizes the imposition of cross-group equality constraints across male and female drinkers. "Ratio" is the ratio of chi-squared to degrees of freedom.

Appendix D

Table D-1. Chi-square Values and Fit Indices for Each Step in the Analysis of Problem Drinking

Step	Sex	df	χ^2	Ratio	NFI	NNFI	CFI	Robust CFI
1	M	8	32.471	4.06	0.966	0.951	0.974	0.968
	F	8	49.122	6.14	0.954	0.927	0.961	0.940
2	M=F	20	85.512	4.27	0.958	0.951	0.967	

Note: M=F symbolizes the imposition of cross-group equality constraints across male and female drinkers. "Ratio" is the ratio of chi-squared to degrees of freedom.

Appendix E

Table E-1. Chi-square Values and Fit Indices for Each Step in the Analysis of the Complete Structural Model

Step	Sex	df	χ^2	Ratio	NFI	NNFI	CFI	Robust CFI
1	M	203	417.675	2.06	0.885	0.928	0.937	0.939
	F	202	487.795	2.41	0.892	0.924	0.933	0.924
2	M	N/A						
	F	203	491.691	2.42	0.891	0.923	0.923	0.923
3	M=F	428	954.310	2.23	0.883	0.926	0.931	
4	M=F	427	940.257	2.20	0.884	0.928	0.933	
5	M=F	426	933.769	2.19	0.885	0.928	0.934	

Note: M=F symbolizes the imposition of cross-group equality constraints across male and female drinkers.
"Ratio" is the ratio of chi-squared to degrees of freedom.